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Revision of the horse fly genera *Lissimas* and *Cydistomyia* (Diptera: Tabanidae: Diachlorini) of Australia

I.M. MACKERRAS, D.M. SPRATT & D.K. YEATES



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Revision of the horse fly genera *Lissimas* and *Cydistomyia* (Diptera: Tabanidae: Diachlorini) of Australia

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Abstract

Two genera of horse flies of the Tribe Diachlorini (Tabanidae), *Lissimas* Enderlein and *Cydistomyia* Taylor in Australia, are reviewed and diagnosed. *Lissimas australis* (Ricardo), the sole species in the genus in Australia, is redescribed. A key is given to 39 *Cydistomyia* species, among them 22 established species are redescribed and 17 species are described as new. The new species are: *Cydistomyia danielsorum*, *C. fergusoni*, *C. tasmaniensis*, *C. hardyi*, *C. exemplum*, *C. obscurus*, *C. sabulosus*, *C. monteithi*, *C. curvabilis*, *C. pilosus*, *C. triangularis*, *C. improcerus*, *C. fenestra*, *C. pruina*, *C. infirmus*, *C. innubilis*, and *C. pseudobrevior*. Six possible new species are described briefly but not named.

Key words: Tabanidae, Diachlorini, *Lissimas*, *Cydistomyia*, Australia

Introduction

The horse flies or Tabanidae (Diptera) are a familiar family of true flies comprising almost 4,400 described species (Evenhuis *et al.* 2008, Biosystematic Database of World Diptera). The Australian tabanid fauna is relatively well known because of their medical and veterinary importance. However, although known more commonly as vectors of diseases such as *Loa loa* in Africa (Dirie *et al.* 1989) and anthrax (Chainey 1993), horse flies also are important pollinators (e.g. Goldblatt *et al.* 2000; Johnson & Morita 2006).

Despite their economic importance, taxonomy within Tabanidae has been historically intractable (Oldroyd 1957; Chainey 1993), and they are among the least understood fly families in terms of modern phylogeny-based classifications or recent global monographic coverage. Many of the external colour characters used in tabanid classification change according to how specimens are collected and preserved, the age of the fly at the time of collection, and the length of time the specimen has been preserved. Most morphological characters involved in classification are structures and bare patches (calli) on the head, but taxonomic emphasis has been placed on colour patterns of the body and wings. As Chainey (1993) stated, these colour patterns “give an effect that is often more easily appreciated by the unaided eye than through a microscope” and are often variable.

This historical use of variable characters in conjunction with a general lack of reliable structural characters and the uniformity and simplicity of the genitalia below tribal level (Mackerras 1954) combine to make identification and classification in this group difficult.

The monophyly of Tabanidae is well supported by both molecular (Wiegmann *et al.* 2000) and morphological evidence (Mackerras 1954; Stuckenberg 2001; Yeates 2002). Most current authors accept Mackerras' classification of Tabanidae based on morphological characters (1954, 1955a, 1955b) and adopt the following subfamilies and tribes: Chrysopsinae (Bouvieromyiini, Chrysopsini, Rhinomyzini), Tabaninae (Diachlorini, Haematopotini, Tabanini), and Pangoniinae (Pangoniini, Philolichini, Scionini) (Chainey 1993).

Mackerras (1954) recognised 3 tribes in the subfamily Tabaninae one of which, the Haematopotini does not occur in Australia. The other two could be distinguished on the basis of the basicosta of the wings covered with dense short setulae (Tabanini) or basicosta without setulae (Diachlorini). One genus, *Tabanus*, was recognised in the Tabanini and three genera were recognised in the Diachlorini, *Lissimas*, *Cydistomyia* and *Dasybasis*. Subsequently, on the basis of examination of type specimens only of some members of the genera *Cydistomyia* and *Dasybasis* Trojan (1994a) (see also Trojan *et al.*, 1997) split the tribe Diachlorini into the Lepidoselagini and the Diachlorini resulting in a number of supraspecific taxa, including *Dasybasis*, being removed from Diachlorini and transferred to Lepidoselagini (Trojan, 1994b).

Trojan (1998) considered the genus *Cydistomyia* to be restricted to the Australian and Oriental regions, along with *Chasmiella* Enderlein *partim* (Australian), *Chalybosoma* Oldroyd (Australian), *Japenoides* Oldroyd (Australian), *Neoboldimyia* Ricardo (Oriental), *Udenocera* Ricardo (Oriental), *Chasmia* Enderlein (Australian), *Lissimas* Enderlein (Australian). Among his Diachlorini, Trojan (1998) recognised only the genera

Cydistomyia and *Lissimas* as occurring in Australia.

Burger (1995) acknowledged Trojan's (1991) criticism of the criteria used to separate *Cydistomyia* and *Dasybasis* in New Caledonia and elsewhere, and in particular the use of the width of the frons (frons or frontal index of Mackerras, 1959, Trojan, 1991), the hairiness of the eyes and the presence or absence of a spur or appendage on vein R_4 . Burger stated that these characters are so variable that they are of limited value and proposed the use of a genal index (= parafacial index of Trojan, 1991) (relative width of the gena) to separate these genera. Nevertheless, he noted that Trojan's (1991) frontal index did not consistently separate these genera even when used in combination with his genal index.

The criticism of the criteria used to separate these genera may well pertain to species in New Caledonia and some surrounding regions however the characters used to separate the genera work well in the Australian fauna. Clarification of the concepts of *Dasybasis* and *Cydistomyia* on a worldwide basis is needed, but is beyond the scope of this work. Consequently, in this work we follow Mackerras' (1954) concept of the tribe Diachlorini.

Australia has just over 240 described species of Tabanidae, and many of these were described by Mackerras in a series of revisionary monographs that appeared between 1956–1971. These monographs treated all the fauna except for the tabanine tribe Diachlorini. This tribe includes two species-rich genera in Australia, *Cydistomyia* Taylor and *Dasybasis* Macquart, and a third genus, *Lissimas* Enderlein. Two of us (IMM and DMS) began to develop two manuscripts revising the Australian Diachlorini in the 1970s. After the death of IMM in 1980 and the diversion of DMS into other research, these manuscripts were not completed.

History of this work

When Part V of this series, Tribe Tabanini, genus *Tabanus* Linnaeus, was published by Mackerras (1971), he noted that a lengthy delay (9 years) between Parts IV and V introduced an element of urgency to complete the series. Material for Parts V and VI was assembled, draft descriptions of most of the species were written, and ancillary notes were prepared. Then Mackerras's editing of the first volume of "*Insects of Australia*" intervened. He proposed to facilitate progressive completion of the work by breaking it into three parts: Tribe Tabanini genus *Tabanus* Linnaeus; Tribe Diachlorini genera *Lissimas* Enderlein and *Cydistomyia* Taylor; and Tribe Diachlorini genus *Dasybasis* Macquart. Recruitment of the junior author (DMS) resulted in further delay. Deteriorating health intervened and Ian Mackerras died on 21 March 1980. By this stage IMM and DMS had drawn together a key to species of *Cydistomyia*, an outline of a manuscript on the genera *Lissimas* and *Cydistomyia*, and completed draft drawings of most of the frons, palps and genitalia of the species. DMS continued with this work until mid-1981, reviewing all the specimens in the ANIC collection as well as the substantial collections held in the School of Public Health & Tropical Medicine and by Mr. Alan L. Dyce. The work subsequently languished because of DMS's research and administrative commitments to CSIRO Division of Wildlife and Ecology (now Sustainable Ecosystems). The two extant authors were spurred to complete these manuscripts by the award of a NSF Partnerships Enhancing the Expertise in Taxonomy (PEET) (DEB 0731528 grant to DKY and others) focussing on the Tabanidae, co-option of editing assistance from Australian Biological Resources Study (ABRS), and technical assistance from the Commonwealth Environmental Research Facility (CERF) funded National Taxonomy Hub. Publication of this work, and the manuscript revising *Dasybasis* will complete the primary taxonomic treatment of the Australian Tabanidae at species level.

Completion of this work is of particular relevance to Australia given the association of the larval stages with the air-water-soil interface, with swampy and boggy areas and with damp and rotting vegetation, and the quarantine risk posed by the role of tabanids in the transmission of diseases.

Economic importance of tabanids in the Australasian Region

Tabanids are involved in both mechanical and biological transmission of diseases of wild animals, domestic livestock and humans (Krinsky 1976). Interrupted feeding, where a tabanid is dislodged from a host and actively and persistently seeks the nearest available host to continue feeding, is the most important factor responsible for their role as efficient mechanical vectors of diseases such as equine infectious anaemia, vesicular stomatitis and hog cholera. The protozoan parasite, *Trypanosoma evansi*, is transmitted mechanically between wild and domestic animals by tabanids causing the disease, surra, and producing significant mortality and production losses in animals in endemic countries. Surra is an exotic disease and considered a high quarantine risk to Australia (AFFA 2003). The movement of livestock with transmigrants from western areas of Indonesia, where *T. evansi* is endemic, into West Papua adjacent to border areas with Papua New Guinea is a major concern. There is potential for spread of the disease with wild or feral hosts into Papua New Guinea (PNG), bringing *T. evansi* into areas where agile wallabies (*Macropus agilis*) and pademelons (*Thylogale brunii*) occur naturally and may serve as reservoir hosts. Rusa deer and pigs are effective reservoir hosts for maintenance and spread of *T. evansi* infection in PNG. Experimental studies of *T. evansi* infection at the Research Institute for Veterinary Science, Bogor, Indonesia, demonstrated that agile wallabies and pademelons are highly susceptible to infection with *T. evansi* and have the potential to spread the disease within New Guinea and Australia if infection is introduced (Reid *et al.* 2001). This high susceptibility is comparable to that of rodents and dogs, and may reflect a lack of contact of wallabies with pathogenic trypanosomes during their evolution. High numbers of trypanosomes in the blood of wallabies persisted until death, suggesting that they are likely to be a source for transmission to other hosts. The presence of *T. evansi* in southern areas of PNG and its proximity to Australia poses the threat of spread into Australia via direct flight or island hopping of tabanids across Torres Strait and into areas of northern Australia where large populations of both agile wallabies and feral pigs exist. One such outbreak occurred on the island of Madura, Indonesia, in 1988 causing high mortality in horses, cattle and buffalo (Payne *et al.* 1990).

Species of *Dasybasis*, *Cydistomyia*, and *Tabanus* are involved in the biological transmission of the filarioid nematode, *Pelecitus roemeri*, found in the intermuscular connective tissues of kangaroos and wallabies, the flies serving as intermediate host and vector (Spratt 1972a, 1972b, 1974a, 1974b, 1975). The occurrence of this parasite is of particular relevance to the kangaroo meat export industry. The Australian Quarantine Inspection Service is responsible for the disposition guidelines for veterinarians assessing carcasses for human consumption. These guidelines stipulate the boning out of heavily infected carcasses and their relegation to the pet food industry.

Materials and methods

Morphological terminology follows Colless and McAlpine (1991), except for wing venation which follows McAlpine *et al.*, (1981). Specimens were examined using Zeiss and Wild stereo dissecting microscopes. Genitalia were drawn using a camera lucida after they were dissected from the macerated terminal segments of the abdomen. Maceration was effected by placing the terminal segments of the abdomen in 10% KOH for 24–36 hrs. Specimens were then washed in 10% glacial acetic acid twice, rinsed in water, then 70% ethanol. Specimens were prepared for drawing by placing them on an excavated slide in glycerine gel. Preparations are stored underneath the specimen, mounted in Canada Balsam between coverslips or in glycerine inside a microvial.

An asterisk (*) is used against species names to indicate type material (holotype, lectotype, syntype, neotype or 'cotype') examined by at least one of the authors.

Abbreviations for Australian States and Territories are as follows:

ACT	Australian Capital Territory
NSW	New South Wales
NT	Northern territory
QLD	Queensland
SA	South Australia
TAS	Tasmania
VIC	Victoria
WA	Western Australia

The list of abbreviations of museums and collections is as follows:

AM	Australian Museum, Sydney, Australia.
ANIC	Australian National Insect Collection, Canberra, Australia.
BMNH	The Natural History Museum (formerly the British Museum (Natural History)), London, UK.
DEI	Deutsches Entomologisches Institut, Munchenberg, Germany
GDCB	Greg and Alice Daniels Collection, Brisbane, Australia.
LSHTM	London School of Hygiene and Tropical Medicine, London, UK.
NMVM	Museum Victoria, Melbourne, Australia (formerly the National Museum of Victoria).
MNHN	Muséum National d'Histoire Naturelle, Paris, France.
QDPI	Queensland Department of Primary Industries, Indooroopilly, Australia.
QM	Queensland Museum, Brisbane, Australia.
NMW	Vienna Museum, Vienna, Austria.
ZMAN	Zoologisch Museum, Universiteit van Amsterdam, Amsterdam, The Netherlands
ZMHB	Museum für Naturkunde an der Universität Humboldt zu Berlin, Berlin, Germany

Subfamily TABANINAE

Diagnosis. Ninth abdominal tergite divided in both sexes, forming lateral plates that may meet in the midline in the male, but are widely separated in the female. Male hypopygium with style truncate. Caudal reinforced section of spermathecal ducts of female with characteristic umbrella-like expansions (Mackerras 1956a: fig. 8G). Ocelli never fully developed. Hind tibial spurs absent. Frons generally with a callus. Flagellum of antenna compacted into a basal plate and 3 or 4 well-defined annuli (always 4 in Australian species). In wings basicosta (i.e. humeral plate) setulose or not; sc strongly setulose below on most of its length; cells R_5 and M_3 open in all Australian species; vein R_4 with or without appendix. Larvae with respiratory siphon protruding, but, in known Australian species, without stigmal spine. Pupal synapomorphic features not yet defined. The subfamily is divided into three tribes (Mackerras 1954), of which the Haematopotini does not occur in Australia. The other two can be distinguished by the following keys.

Adults

In wings, basicosta without setulae	Diachlorini
Basicosta covered with dense short setulae similar to those on costa	Tabanini

Larvae

Respiratory siphon less than half as long as its basal diameter; body uniformly and regularly striate;

mostly terrestrial Diachlorini
 Respiratory siphon at least as long as its basal diameter; striae on body reduced; mostly aquatic ..Tabanini

The key character holds good, without equivocation, for all adult Australian Tabaninae that we have seen, although it is not so reliable in some other parts of the world. Other trends, noted below, usually enable one to distinguish the tribes before looking at the basicosta; but they are only trends, and we have not yet been able to find differential characters of even that degree of reliability in the terminalia of either sex.

Tribe DIACHLORINI

In addition to the absence of setulae on the basicosta, females generally have the frons parallel or distinctly divergent, the antennal scape not tending to develop into a hood over the pedicel, the palpi more or less swollen basally and tapered gently to a rounded apex, and the proboscis relatively stout and with relatively large labella. The eyes of the females are rarely banded or bicoloured; those of males are often markedly inflated, with the enlarged upper facets especially prominent. Otherwise, sexual dimorphism is rarely notable. In general habitus the species tend to be less robust than most Tabanini. The larvae tend to be less torpedo-shaped and have far less prominent pseudopodia than larvae of Australian Tabanini.

Key to Australian genera of Diachlorini

1. Wings with sharply defined dark pattern; eyes of female (relaxed) with two green bands; antennal scape more than twice as long as wide; slender, *Chrysops*-like species *Lissimas* Enderlein
 Wings with diffuse dark pattern or occasionally spotted; eyes of female with at most one green band; antennal scape not significantly longer than wide; not *Chrysops*-like species.....2
2. Eyes generally bare (Footnote 1) in both sexes; frons of female relatively narrow (index generally greater than 3.5); callus almost always well developed but generally narrower than frons at its base; vein R₄ generally smoothly curved and without strong appendix; (rudimentary appendix may be present on one or both wings (Footnote 2); terminal abdominal segments of female always dorsoventrally compressed; smooth-bodied species..... *Cydistomyia* Taylor
 Eyes hairy, at least on upper facets of male, sometimes bare in female; frons usually wider (index rarely more than 3.5); callus almost always well developed and generally full width of frons at its base; vein R₄ generally with strong appendix; terminal abdominal segments of female sometimes laterally compressed; hairy or smooth-bodied species *Dasybasis* Macquart

Genus *Lissimas* Enderlein

Lissimas Enderlein, 1922: 350, 1925: 336; Mackerras 1962b: 106, figs 7–8, 10 (as subgenus of *Cydistomyia*), 1964: 101, figs 37–43; Daniels 1989: 291; Trojan 1998: 72; Bickel & Elliot, 1998-2005: 11. Type species. *Lissimas fenestratus* Enderlein, by monotypy. [Sulawesi (as Celebes)].

Paracanthocera Enderlein, 1923: 545, 1925: 333; Oldroyd 1949: 331 (removed from Enderlein's tribe *Acanthocerca* into his Diachlorini where it runs to *Lissimas*); Mackerras 1959: 165, 1962: 105 (as subgenus of *Cydistomyia*), 1964: 101 (as synonym of *Lissimas*). Type species. *Acanthocera australis* Ricardo, by monotypy. [North Queensland].

Diagnosis. Essential features that distinguish this genus from *Cydistomyia* are banded eyes; shape and usually length of antennae; presence of either a pouting, shiny subcallus or a bulging, shiny face; body form rather *Chrysops*-like; and general resemblance between less clearly differentiated species and those distinguished by

more definite characteristics of the head or pattern of wings.

Description. Female. Eyes bare, usually (perhaps always) banded. Frons medium (index 3.5–5.0), slightly convergent to slightly divergent, usually dark, often more or less shiny; ocellar tubercle absent or rudimentary; callus large, spear- or wedge-shaped; subcallus pouting, more or less thinly tomentose, sometimes completely shiny; parafacials medium to narrow, thinly tomentose; face normal and tomentose, or more or less bulging and shiny; antennae relatively long and slender, usually longer than thickness of head, scape cylindrical and usually more than 2X as long as wide; palpi usually slender to medium, sometimes slightly shiny; proboscis short and stout. Thorax and legs normal. Wings often with conspicuous pattern; R_4 strongly curved, but usually without appendix. Abdomen elongate, usually parallel-sided; terminal segments dorsoventrally compressed; sternite 8 usually with wide, shallow gonapophyses. Small to medium sized (10–15 mm), narrow-bodied, smooth, usually rather ornate.

Male. The three known males differ so markedly that it is not possible to frame a satisfactory diagnosis. *Lissimas moestus* Szilady from the Celebes [= Sulawesi] (one specimen) was described as having eyes with the area of larger facets not sharply demarcated; ocellar tubercle narrow and deeply sunken; antennal scape bell-shaped and almost 2X as long as wide; palpi slender, of unusually primitive form; and R_4 without appendix. *Lissimas australis* from northern Qld (two specimens), has the enlarged upper facets sharply demarcated from the small lower ones by the size contrast and the presence of a green to greenish blue band; ocellar tubercle not visible; antennal scape cylindrical and more than 2X as long as wide; palpi short and almost globular; R_4 with inconstant rudimentary appendix.

A key to the species of *Lissimas* was provided by Mackerras (1964: 102–103).

Lissimas australis (Ricardo)

**Acanthocera australis* Ricardo, 1915b: 16; Surcouf 1921: 90 (as ?*Acanthocera*). Holotype female, N Qld, Kuranda (stated to be in ZMHB, but in BEI; specimen in BMNH is mis-labelled as type but probably a paratype).

Paracanthocera australis; Enderlein 1923: 545, 1925: 333; Oldroyd 1949: 331; Mackerras 1959: 165. [Subsequent more detailed study of the New Guinea and island species (Mackerras 1964: 101–104) has shown that allocation of *australis* to *Paracanthocera* was not justified].

Udenocera australis; Taylor 1926: 193 (transferred on advice from Austen).

Lissimas australis; Mackerras 1964: 103, fig. 42; Daniels, 1989: 291; Bickel & Elliot, 1998–2005: 11.

Other material examined. 5 ♀, 3 ♂.

Diagnosis. The only member of the genus found in Australia, this is a striking, slender, dark brown species, with sharply defined dark brown pattern on wing, narrow white apical bands on 1st and 2nd abdominal tergites, and brown to yellowish brown legs.

Body length 14 mm, antennae 3.5 mm.

Female. Head. Eyes (relaxed) purple-brown with 2 oblique green bands, bare. Frons slightly divergent, index 4.3, covered with dark grey tomentum; no ocellar tubercle; callus brownish black, raised, bulbous, almost full width of frons at base and with narrowly ridged extension nearly to vertex. Subcallus slightly shiny, brown, more yellowish around antennae and in mid-line, and with greyish overlay laterally; parafacials blackish grey, with thin paler grey overlay, and with scattered inconspicuous brown hairs; face polished, dark brown, with short inconspicuous brown hairs, tentorial pits large and deep; beard sparse, brown to yellowish brown. Antennal scape and pedicel brownish yellow, with brown and black hairs; flagellum brownish yellow at extreme base, becoming darker brown distally, with some thin yellowish tomentum on basal annulus, and with little group of short spine-like dark brown hairs at basal angle dorsally. Palpi with second segment markedly swollen on basal half, dark brown, with greyish overlay and dark brown hairs. Proboscis very short; labella large.

Thorax. Scutum brown, with greyish tomentum on dorsocentral vittae and notopleural lobes; hairs dark brown, inconspicuous, mixed with some paler ones at sides; scutellum brighter brown than scutum, with dark brown hairs. Pleura brown, with propleura grey and some greyish overlay elsewhere; hairs fine, not conspicuous, mostly brown, with creamy white zone along posterior margin of upper mesopleural convexity, conspicuous white squamal tuft and some creamy white hairs between coxae.

Legs. Coxae brown (like pleura), fore with brown hairs, mid and hind with mainly whitish hairs; femora brown, fore paler than others; tibiae and tarsi brownish yellow, those of hind legs darker than others; hairs on all segments mainly dark brown.

Wings. Deep brown from base to apex, clear posteriorly, dividing line quite sharply marked along R_4 , in nearly a straight line from fork of R_{4+5} to apex of $A_1 + CuA_2$, and straight back to base along A_1 . The following clear areas occur within the dark colour: a small one at extreme base, one at base of basal radial cell, and one between sc and R_1 near tip of sc , one between R_1 and Rs , and a keyhole-shaped area across the basal cells just basal to fork of M . Less definite, elongate, clearer areas occur in cell r_{2+3} , the discal medial cell, and cells cua_1 and cup . Stigma dark brown, veins darker basally, paler distally; R_4 angulate, with short inconstant appendix.

Abdomen. Dark cinnamon brown, covered with dark brown hairs, 1st tergite somewhat paler and with greyish cream hairs; narrow but conspicuous pale greyish apical bands with white hairs on 1st and 2nd tergites. Venter similar to dorsum, pale apical band present only on 2nd sternite.

Male. Closely similar to female in colouration and pattern. Eyes (relaxed) moderately large, bare, upper enlarged facets reddish brown, lower and posterior small ones brown, with green band across middle, widening and turning greenish blue posteriorly and in upward extension behind large facets; ocellar tubercle not visible. Frontal triangle greyish black; subcallus darker than in female, parafacials similar, face polished only at sides, tomentose and apparently membranous in middle. Palpi short, plump, almost globular, dark brown with brown-black hairs. Posterior fringe on mesopleural convexity with mixed brown and white hairs, relatively inconspicuous.

Distribution. From Atherton Tableland N QLD to near Gordonvale.

Kuranda, Mar., W.D. Dodd, I.F.B. Common, M.S. Upton, Nov., D.H. Colless (at light); F.H. Taylor; Mt Misery SW Cooktown, G.A. Daniels; Windsor Tablelands, Dec., J.S.P. Hasenpusch; Meringa, on *Eugenia*.

Genus *CYDISTOMYIA* Taylor

Cydistomyia Taylor, 1919: 47; Oldroyd 1949: 342; Mackerras 1959: 166; 1971b: 419; Daniels 1989: 285; Trojan 1998: 69; Bickel & Elliot, 1998-2005: 2. Type species. *Cydistomyia doddi* Taylor (= *C. albithorax* Ricardo), by monotypy [New Guinea; wrongly recorded as Kuranda, north Qld].

Chasmia Enderlein, 1922: 344, 1925: 331; Oldroyd 1949: 333; Mackerras 1962b: 105 (as subgenus of *Cydistomyia*); Mackerras 1971b: 412 (restored as genus); Daniels 1989: 285; Trojan 1998: 20. Type species. *Chasmia bicincta* Enderlein (= *C. basifasciata* de Meijere), by monotypy [New Guinea].

Chasmiella Enderlein, 1922: 344, 1925: 331; Oldroyd 1949: 333; Mackerras 1962: 107 (as synonym of *Chasmia*); Mackerras 1971b: 414 (as one of two subclones, *Chasmia*, *sensu stricto* and "*Chasmiella*"); Trojan, 1998: 69 (removal from synonymy with *Chasmia*). Type species. *Tabanus brevisculus* Walker, by monotypy [New Guinea].

Diagnosis. Very small to large, usually of medium build, but sometimes slender or rotund; body smooth, non-metallic (except *C. casuarinae*, *C. cyanea*), sometimes rather bare; body length 6–21 mm.

Female. Eyes bare (except *C. casuarinae*, *C. improcerus*, *C. pruina*, *C. victoriensis*), unbanded (except *musgravii*, *rivularis*, *atmophora*). Frons mostly or entirely tomentose, slightly convergent to slightly divergent, index greater than 3 (except *C. heydoni* [Papuan], *C. griseicolor*); callus usually well developed (absent or rudimentary in three Papuan species); subcallus tomentose (except in two Papuan species); parafacials tomentose; face usually tomentose, occasionally more or less shiny; antennae sometimes slender, scape at

most slightly swollen; palpi usually slender. Thorax and legs undistinguished. Wings sometimes long, sometimes diffusely darkened, but almost entirely blackish in *C. kamialiensis* and *C. imitans* [Papuan] (cf. Goodwin 1999); R_4 usually without appendix (rudimentary in some: *C. torresi* and *C. brevior*). Terminal abdominal segments usually dorsoventrally compressed, occasionally modified (*C. lamellata* group [Papuan]).

Male. Sexual dimorphism slight to moderate. Eyes usually bare (except *C. casuarinae*, *C. palmensis*, *C. bancroftae*, *C. improcerus*, *C. victoriensis*, *C. musgravii*, *C. rivularis*), upper facets usually enlarged and contrasting with lower; ocellar tubercle sometimes small and hidden, usually visible at vertex; palpi conical or acorn-shaped. Terminalia undistinguished.

It is difficult to frame a satisfactory definition of this genus, because it is characterised essentially by lack of specialisation. Moreover, the incipient specialisations that do occur introduce numerous exceptions into what could otherwise be simple statements. The general features of the type species, including its rather broad build and unusual thoracic pattern, represents a divergent branch rather than the central core of the genus. The Australian species are less diverse than the Papuan species, suggesting that they have been subjected to less intense selection pressures. An appendix on R_4 is common in Papuan species.

Key to females of Australian species of *Cydistomyia*

1. Dark blue to greenish, shiny metallic species2
- Not blue, green or metallic3
- 2(1) Wings spotted; antennal flagellum black; frons index 4.0-4.5 (Figs. 2, 13); N QLD, NSW
..... *casuarinae* English, Mackerras & Dyce
- Wings not spotted; antennal flagellum contrasting orange; frons index 6.0-7.0 (Figs. 2, 14); central and S QLD, NSW *cyanea* (Wiedemann)
- 3(1) Small yellowish brown species (8-11mm); in wing, vein R_4 angulate, without well-defined appendix, with or without rudimentary stump generally on one wing only4
- Without above features5
- 4(3) In wing, R_4 strongly angulate often with rudimentary appendix (stump) on one wing only; ocellar tubercle generally well-defined; callus tapering extension reaching a little above middle of frons; subcallus flat; pedicel with dorsal prolongation; abdominal tergites yellowish basally and with pale bands apically; frons index 4.2-4.4 (Fig. 49); NT *brevior* (Walker)
- In wing, R_4 strongly angulate but without rudimentary appendix; ocellar tubercle inconspicuous; callus tapering extension generally not reaching middle of frons; subcallus bulging; pedicel without dorsal prolongation; abdominal tergites 2-4 with median triangles in midline; frons index 4.0-4.2 (Fig. 50); N QLD *pseudobrevior* Mackerras & Spratt, **sp. nov.**
- 5(3) Robust (14-15 mm) squarely built, dark brown to black species; most of body except eyes covered in dense black hairs; antennal flagellum pale orange, basal plate relatively narrow with small dorsal tooth, tibiae dark brown; frons index 5.2 (Fig. 31); S coastal Qld, N coastal NSW
..... *pilosus* Mackerras & Spratt, **sp. nov.**
- Without above features6
- 6(5) Abdomen brown, with more or less complete black median vitta; wings clear or with brown suffusion along veins but never with discrete brown cloud in apical half of wing7
- Without above features; if black median vitta present then wings with discrete brown cloud in apical half14
- 7(6) Medium-sized (14 mm) grey species, callus quadrate with short narrow lateral extensions and narrow median extension to middle of frons, wings clear, stigma pale brown, venter mahogany brown with dark median lunulate markings, frons wide, index 3.9 (Fig. 20); TAS

-*tasmaniensis* Mackerras & Spratt, **sp. nov.**
- Small to medium-sized (10-14 mm) brown species, callus quadrate, without short narrow lateral extensions, wings pale grey or clear, stigma conspicuous bright brown, venter black or uniformly pale grey 8
 - Not such species 9
 - 8(7) Palpi black, antennae black, venter black, wings greyish to almost clear, stigma bright brown, R₄ sharply angulate with vestige of appendix on one or both wings, frons index 5.0-5.8 (Fig. 15); Torres Strait *torresi* (Ferguson & Hill)
 - Palpi fawn grey, antennae orange-brown, venter uniformly pale grey, wings clear, stigma conspicuous brown, R₄ not sharply angulate without vestige of appendix on one or both wings, frons wide, index 3.2-3.3 (Fig. 16); N Qld, NT *danielsorum* Mackerras & Spratt, **sp. nov.**
 - 9(7) Callus pyriform, wings uniformly pale greyish, stigma inconspicuous brown, venter brownish grey, frons index 3.7-4.4 (Fig. 19); SE Qld, NSW *fergusoni* Mackerras & Spratt, **sp. nov.**
 - Not such species 10
 - 10(9) Antennal flagellum undersized, short and stubby 11
 - Antennal flagellum not undersized 12
 - 11(10) Small (10–12 mm) species; antennal basal plate dark brown, style black; callus shiny dark brown, large, triangular, full width of frons at base, extending to conspicuous ocellar tubercle, anterior ocellus usually present; frons index 4.2 (Fig. 32); S coastal QLD
.....*triangularis* Mackerras & Spratt, **sp. nov.**
 - Medium-sized (15–16 mm) species; antennal flagellum entirely black, callus shiny black, small, tear-drop shaped, less than width of frons at base, with tapering extension to upper third of frons, ocellar tubercle inconspicuous; frons index 3.3-4.9 (Figs. 11, 34); Ebor, NSW
.....*improcerus* Mackerras & Spratt, **sp. nov.**
 - 12(10) Wings clear, antennal basal plate with gentle basal dorsal angle, small tooth and rounded apical ventral swelling, antennal pedicel with pronounced anterior prolongation almost reaching dorsal tooth of basal plate; frons index 3.2 (Fig. 42); SE NSW, VIC *infirmus* Mackerras & Spratt, **sp. nov.**
 - Wings with brown suffusion along veins, antennal basal plate with acute dorsal angle and sharp upward pointing tooth, pedicel without pronounced anterior prolongation 13
 - 13(12) Medium-sized (13–15 mm) species; antennal flagellum with contrasting bright orange basal plate and black style; black vitta on abdomen well-defined, median pale hairs generally forming conspicuous enclosed pale vitta but vitta may be interrupted or entirely absent; tibiae yellowish; frons index 4.8-5.1 (Fig. 33); S coastal QLD *duplonotata* (Ricardo)
 - Variably sized, 14–19 mm, broad or narrow-bodied species; antennal flagellum uniformly greyish black; abdomen reddish brown with vague blackening especially on fifth and subsequent tergites; legs predominantly black; frons index 4.7-5.9 (Fig. 35); S coastal QLD, N coastal NSW
.....*laticalloso* (Ricardo)
 - 14(6) Small- to medium-sized (10–15 mm) dark shiny chocolate brown species; abdominal tergites 2–5 with narrow inconspicuous pale apical margins and well-defined white-haired median triangles; wings prominently suffused with brown, stigma large and conspicuously shiny bright brown; with characteristic dark brown median lunulate markings contrasting with pale grey lateral areas on sternites; basal plate narrow, with small sub-basal dorsal tooth; frons index 5.4-5.7 (Fig. 17); N QLD
.....*palmensis* (Ferguson & Hill)
 - Not such species 15
 - 15(14) Small- to medium-sized (11-14 mm) dark brown but not shiny, chocolate brown species; abdomen generally darker on distal tergites than on tergites 1–3, and with inconspicuous white-haired median triangles on tergites 2–5; wings lightly suffused with brown, stigma generally smaller and less con-

- spicuous brown than in *palmensis*; sternites without dark brown lunulate markings; frons variable but narrow, index 4.7–6.4; basal plate more robust than *palmensis* and with well-defined almost median dorsal angle; frons index 4.7–6.4 (Figs. 9, 18); N QLD *pseudoardens* (Taylor)
- Not such species16
 - 16(15) Small to medium-sized (10–15 mm) dull or pale brown species with moderately to well-defined apical bands on abdominal tergites and median triangles on some or all tergites17
 - Similar-sized rather plain dark brown species with narrow pale apical bands without median triangles on abdominal tergites or without abdominal markings20
 - 17(16) Scutum distinctly vittate.....18
 - Scutum not vittate19
 - 18(17) Scutum with broad median and narrower lateral black vittae each containing rows of dark brown horizontal stripes, giving a herring-bone appearance; frons narrow, index 7.2 (Fig. 23); SE QLD *exemplum* Mackerras & Spratt, **sp. nov.**
 - Scutum without herring-bone appearance; frons wide19
 - 19(18) Small (12 mm) species; callus triangular, about half width of frons at base; wings uniform grey brown, without brown suffusion in cells, along vein margins or on stigma; frons index 4.1 (Fig. 26); coastal NSW *monteithi* Mackerras & Spratt, **sp. nov.**
 - Small- to medium-sized (12–15 mm) species, callus oval or tear-drop shaped, wings clear except for brown suffusion in costal and/or subcostal cells and brown stigma; frons index 3.7–4.5.....20
 - 20(19) Callus oval with short narrow extension to about middle of frons; antennal flagellum elongate, pedicel with anterior prolongation; palps narrow; frons index 3.7 (Fig. 24); N QLD *obscurus* Mackerras & Spratt, **sp. nov.**
 - Not such species.....21
 - 21(20) Callus narrow, tear-drop-shaped, extending three-quarters length of frons; antennal flagellum not elongate, pedicel without anterior extension; palps fleshy; frons index 4.5 (Fig. 25); SE QLD *sabulosus* Mackerras & Spratt, **sp. nov.**
 - Not such species.....22
 - 22(21) Antennal flagellum primitive, short and stubby; body usually drab and lacking any pattern, dark chocolate brown or pale brown dimorphic species; callus greatly reduced indistinct, dark, linear; frons wide, index 3.0–4.0 (Figs. 10, 22); QLD., NSW *bancroftae* Mackerras
 - Antennae not short and stubby; body not patterned, not drab; callus not indistinct and linear23
 - 23(22) Frons wide, index 2.0–2.5; a 10–11 mm rather slender, concolorous greyish fawn species with small irregularly quadrate mahogany brown callus (Fig. 51); NW QLD *griseicolor* (Ferguson & Hill)
 - Frons narrower, index not less than 3; not as above in other respects24
 - 24(23) Wings not suffused with brown or yellowish brown in cells or along wing margins, costal cell not darkened25
 - Wings suffused, often conspicuously, with brown or yellowish brown in cells or along vein margins, costal cell entirely brown30
 - 25(24). Basal plate of antennal flagellum broad and with recurved dorsal angle bearing short forwardly directed tooth; frons index 4.8 (Fig. 30); NT *curvabilis* Mackerras & Spratt, **sp. nov.**
 - Basal plate of antennal flagellum without recurved dorsal angle and without forwardly directed tooth26
 - 26(25) Small (9–12 mm) dark brown to greyish black species with narrow but well-defined apical bands and variable median triangles on abdominal tergites27
 - A very small (8 mm) brown species with unbanded eyes, antennal scape and pedicel without dorsal prolongations; abdominal venter without dark median vitta; frons index 4.3 (Fig. 47); Stradbroke Is., S coastal QLD *silviformis* (Taylor)

- 27(26) Eyes with narrow oblique green band; callus nearly full width of frons at base; basal plate of antennal flagellum not wide, with gently rounded dorsal angle posteriorly; frons index 3.0–3.8.....28
- Eyes unbanded; callus markedly less than full width of frons at base, elongate, pyriform, tapering into moderately narrow extension reaching one half to two thirds length of frons; basal plate of antennal flagellum wide, with sharp dorsal angle posteriorly; frons index 3.7–4.1 (Fig. 48); NT
..... *innubilis* Mackerras & Spratt **sp. nov.**
- 28(27) Abdominal venter with broad dark median vitta on at least sternites 2–5; ocellar tubercle indistinct; frons with numerous black hairs, index 3.0–3.6 (Figs. 8, 45); S QLD, NSW
..... *rivularis* (Ferguson & Hill)
- Abdominal venter without broad dark median vitta; ocellar tubercle distinct.....29
- 29(28) Vein sc with only a few scattered setulae above; callus pyriform and usually tapering evenly into extension which reaches one-half to two-thirds length of frons; ocellar tubercle distinct, shiny, usually with well-defined anterior ocellus; abdominal venter grey; frons with scattered black hairs, index 3.0–3.8 (Fig. 44); QLD, NSW, VIC *musgravii* (Taylor)
- Vein sc with continuous row of setulae above; callus more oblong, with irregular but fairly wide tapering extension to above middle of frons; ocellar tubercle distinct, shiny, without well-defined anterior ocellus; abdominal venter dark, shiny, banded; legs, antennae and palps darker than *musgravii*; frons with scattered relatively long black hairs index 3.4–3.9 (Fig. 46); N QLD
..... *atmosphora* (Taylor)
- 30(24) Black to brownish black (not shiny chocolate brown) or dark slate greyish species; antennae and legs blackish; wings generally conspicuously suffused with brown31
- Brown species; antennae and legs brown; wings variably suffused with brown along vein margins ...
.....37
- 31(30) Abdominal tergites with large well-defined pale median triangles and more or less interrupted apical bands.....32
- Abdominal tergites without large well-defined pale median triangles and with more or less narrow pale apical bands35
- 32(31) Wing with distinct brown cloud in apical half; mostly northern and coastal species33
- Wing without distinct brown cloud but with more uniform brown suffusion in cells and along veins; a mostly southern, blackish brown, montane species; frons index 4.0–4.6 (Fig. 39); Blue Mtns, NSW; Wilson's Promontory, VIC *wentworthi* (Ferguson & Hill)
- 33(32) Basal plate of antennal flagellum with dorsal angle produced into long forwardly directed tooth reaching two-thirds distance to base of style; frons index 5.8–7.3 (Figs. 4, 36); N QLD
..... *doddi* (Taylor)
- Basal plate of antennal flagellum with dorsal angle produced into short tooth projecting upwards or slightly forwards; frons index <634
- 34(33) A black and white species with brown suffusion almost uniformly distributed in cells in apical half of wing; dorsal tooth on antennal basal plate not projecting anteriorly; callus oblong with narrow extension; frons index 4.3–5.3 (Figs. 5, 37); central coastal QLD *magnetica* (Ferguson & Hill)
- A variable often partly brownish and white species with brown suffusion on apical half of wing not uniformly distributed in cells but restricted to margins of wing veins; dorsal tooth on antennal basal plate with slight forward projection; callus less oblong with broader more tapering extension; frons index 4.5–5.7 (Figs. 6, 38); S QLD, N coastal NSW *alternata* (Ferguson & Hill)
- 35(31). Large (16–21 mm) squarely built dark slate grey to black concolorous species (some southern specimens with more/less evident paler abdominal pattern), wings with brown suffusion particularly along margins of veins; abdomen with narrow inconspicuous pale margins on apices of tergites and not bearing creamy hairs; frons index 4.0–5.4 (Figs. 7, 12, 43); S QLD, NSW, VIC

- *victoriensis* (Ricardo)
- Generally smaller (14–17 mm) less squarely built, paler brown to slate grey species, wings without suffusion along veins, uniformly clouded brownish grey or clear36
 - 36 (35) Eyes green (in life and relaxed), wings generally uniformly clouded brownish grey with clear window in basal portion of cell R_1 extending apically to basal edge of stigma; callus pyriform with extension reaching almost to ocellar tubercle; antennal basal plate with acute dorsal angle, tooth often projecting anteriorly; hairs on both palpal segments all black; scutum with clear indication of dark median and lateral vittae, with narrow pale apical margins and median triangles both covered with fine white hairs on abdominal tergites; frons index 6.6–6.9 (Fig. 40); coastal QLD, NSW,
..... *fenestra* Mackerras & Spratt, **sp. nov.**
 - Eyes black (relaxed), wings clear without brown clouding or suffusion; callus pyriform with extension reaching only to mid-frons; antennal basal plate with gentle dorsal angle; hairs on palpal segment 1 mixed black and white, on segment 2 all black; scutum without indications of vittae, with conspicuous pale apical margins bearing line of creamy white hairs on all abdominal tergites, sometimes with minute median triangles on tergites 2–5; frons index 3.5–4.5 (Figs. 41); montane NSW, VIC
..... *pruina* Mackerras & Spratt, **sp. nov.**
 - 37(30) Large (16–20 mm) generally wide-bodied species38
 - Smaller (12–16 mm) narrower-bodied species39
 - 38(37) A robust (17–20 mm) common reddish brown species with robust basal plate bearing right-angled sub-basal dorsal angle and small apical ventral angle; callus conspicuous, oblong dark; apical and median abdominal markings ill-defined; venter brown; vein sc with continuous row of setulae above; frons index 5.1–6.6 (Figs. 3, 27); S QLD, NSW *nigropicta* (Macquart)
 - A robust (16 mm) dull brown species with smaller basal plate bearing gentle dorsal angle; callus pear-shaped, pale yellowish brown; apical markings on abdominal tergites ill-defined, median markings conspicuous, triangular; venter grey; vein sc with sparse and irregular setulae above; frons index 4.0 (Fig. 21); Katoomba, NSW *hardyi* Mackerras & Spratt, **sp. nov.**
 - 39(37) Medium-sized (13–16 mm) species with greyish brown scutum and yellowish brown abdomen darkening distally; wings conspicuously suffused with yellowish brown along all veins; basal plate of antennal flagellum smoothly rounded ventrally and with sharp right-angled dorsal angle sometimes developed into short forwardly directed tooth; frons index 4.8–5.5 (Fig. 29); coastal QLD
..... *avida* (Bigot)
 - Medium-sized (12–16 mm) heavier-bodied, parallel-sided reddish brown species with generally contrasting dark dorsum and pale greyish pleura and venter; wings lightly and uniformly suffused with greyish brown; basal plate short and bearing gentle median dorsal and ventral angles; frons index 3.8–4.4 (Fig. 28); S QLD NSW *hyperythrea* (Bigot)

***Cydistomyia casuarinae* (English, Mackerras & Dyce)**

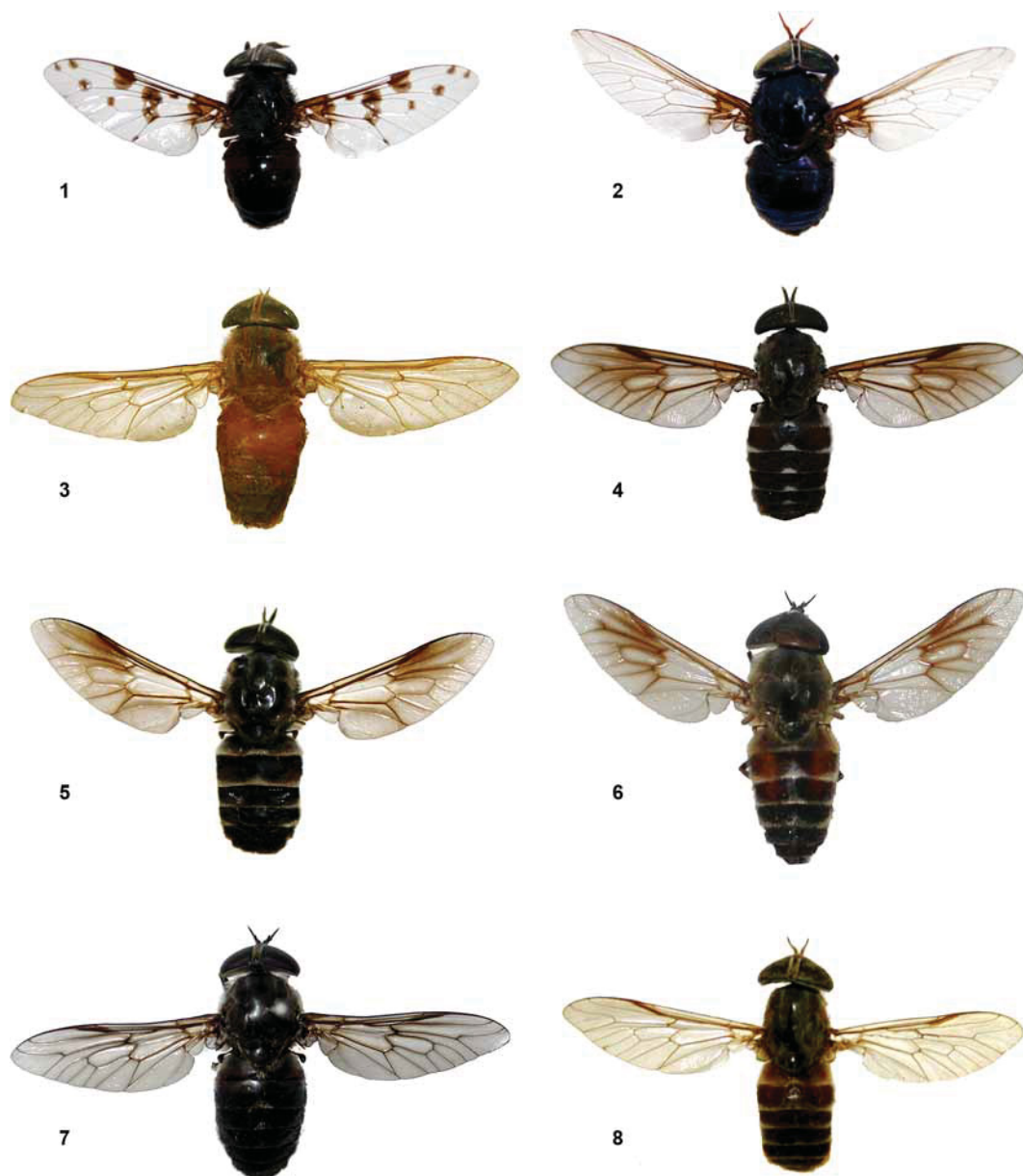
(Figs. 1, 13)

**Chalybosoma casuarinae* English, Mackerras & Dyce, 1957: 292, figs 1–21, plate XIII, figs 1–4; Mackerras 1959: 166. Holotype female and paratype male (as allotype), NSW, Merricumbene, bred from pupae, Dec. 1954 and 1955, A.L. Dyce (ANIC). Subsequent detailed study of the Papuan species (Mackerras 1964: 107–108) showed that allocation of *casuarinae* and *cyanea* to *Chalybosoma* was not justifiable.

Cydistomyia casuarinae (English, Mackerras & Dyce) Daniels, 1989: 286; Bickel & Elliot, 1998–2005: 3.

Other material examined. 6 ♀, 2 ♂.

Diagnosis. A thickset dark metallic blue-green species; related to *C. cyanea* but readily distinguished by the entirely black antennal flagellum and spotted wings. Length 10.0–12.5 mm.



FIGURES 1–8. Habitus images **1.** *Cydistomyia casuarinae* (English, Mackerras & Dyce) wing length 11 mm. **2.** *Cydistomyia cyanea* (Wiedemann) wing 12 mm. **3.** *Cydistomyia nigropicta* (Macquart) wing: 18 mm. **4.** *Cydistomyia doddi* (Taylor) wing 13.5 mm. **5.** *Cydistomyia magnetica* (Ferguson & Hill) wing: 14 mm. **6.** *Cydistomyia alternata* (Ferguson & Hill). **7.** *Cydistomyia victoriensis* (Ricardo) wing: 16mm. **8.** *Cydistomyia rivularis* (Ferguson & Hill) wing: 9mm.

Female. Head. Eyes in life dark metallic green, with short sparse hairs just visible at 15X magnification. Frons medium, index 4.0–4.5, parallel or slightly divergent, covered with thick silvery white tomentum through which dark ground colour shines at certain angles, hairs black, short, inconspicuous; vertical triangle prominent, somewhat swollen, shiny dark blue, with black hairs; puncture at anterior angle, but no ocellar tubercle; callus greenish black, shiny, lower part somewhat swollen and wrinkled, about four-fifths width of frons at base. Subcallus rather prominent, shiny, blackish brown, with faint tomentose overlay; parafacials dark brown, somewhat shiny, with black hairs; face more definitely shiny, with some thin white tomentum in middle below antennae and with black hairs; tentorial pits large, deep and prominent; beard black. Antennal scape shiny, blue-black, with black hairs; pedicel black, with black hairs; basal plate dull blackish brown, of unusual shape, style short, same colour as plate. Palpi shiny, blue black, with black hairs.

Thorax. Scutum and scutellum metallic dark blue-green with thin ashy dusting, more purplish blue laterally, indications of median line anteriorly, hairs black. Pleura somewhat shiny, bluish to brownish black, with black hairs.

Legs. Black with dark purple reflections, except for cream fore distal femur and proximal tibia and more brownish mid and hind distal femur and proximal tibia; hairs black, except for pale antero-ventral zone on fore tibiae and reddish brown zone ventrally on tarsi; pulvilli cream, prominent. Fore tibiae markedly swollen, mid and hind less so.

Wings. Clear over most of membrane; stigma blackish; veins dark brown. There are the following conspicuous dark brown marks: one filling cells at extreme base of wing and extending a little into basal cells, small one on Rs just beyond fork of R, transverse band covering apices of basal cells, one extending from costa through stigma and R_{2+3} (which is curiously sinuous) to reach R_{4+5} and five small spots apically and posteriorly at tip of R_{2+3} , tip of R_4 , fork of R_{4+5} , fork of M_{1+2} , and tip of $A1+CuA2$. Vein R_4 angulate, sometimes with rudimentary appendix. Basicosta bare.

Abdomen. Dark metallic bluish green above and almost blue-black below, with brownish hue at lateral edges of 1st and 2nd tergites in older specimens; hairs entirely black. Sternite 8 narrower than in *cyanea*, with much narrower, deeper gonapophyses; spermathecal bulbs slender, pale.

Male. Similar to female. Eyes with upper facets distinctly enlarged, bright orange with yellow reflections, lower and posterior small facets rich blue, with purple zone at margin of upper facets; hairs more evident than in female, especially on upper facets. Antennae more slender; palpi short, acorn-shaped. Swelling of tibiae may be slightly less than in female, hind tibial fringes better defined. Genitalia without distinctive characters.

Remarks. English, Mackerras & Dyce (1957) gave an excellent description of the larva and pupa of this species, which were found in cavities made by a longicorn beetle, *Agrianome spinicollis* (Macquart) in the trunks of *Casuarina cunninghamiana* Mig. The larvae are like those of other Diachlorini, but the pupae have the lateral arms of the posterior spiracles (= aster) greatly enlarged (see their Text-fig. 21).

Distribution. Atherton region of NE QLD and Merricumbene in NSW. **QLD:** Kuranda, A.P. Dodd; Imbil, Feb., F.A. Perkins; Boomer Range, Sept., C.J. Burwell and G.B. Monteith (raised from pupae); 22 km SE Yarraman, Jan., C.J. Burwell and D.C. Darling. **NSW:** Merricumbene, bred, Nov.–Dec., A.L. Dyce.

Cydistomyia cyanea (Wiedemann) (Figs. 2, 14)

Tabanus cyaneus Wiedemann, 1828: 152; Macquart 1850: 30 (recorded erroneously from Tasmania); Froggatt 1911: 14, 1915: 15; Ricardo 1915a: 284; White 1915: 16; Ferguson & Henry 1920: 844; Ferguson 1920: 132, 1921a: 373; Surcouf 1921: 66 (erroneously attributed to Macquart). Holotype female, stated to be from unknown locality (ZMHB). It was found by Professor F. Peus (in litt.) to agree well with a female from Queensland that was sent to him for comparison, and he also reported that the type bore a label 'Nov. Holl., Melly.'

Selasoma cyaneum; Macquart 1838: 188; Walker 1854: 273; Ricardo 1904: 354.

Chalybosoma cyanea; English, Mackerras & Dyce 1957: 291; Mackerras 1959: 165 (see note under *C. casuarinae*).

**Tabanus cyaneoviridis* Macquart, 1850: 31; Froggatt 1911: 14, 1915: 15; Ricardo 1915a: 284 (syn. of *cyaneus* Wied.); Mackerras 1959: 165 (confirmed synonymy). Holotype female, 'Tasmanie' (erroneous Hardy, 1929: 63, see Remarks) (MNHN).

Cydistomyia cyanea (Wiedemann) Daniels 1989: 286; Bickel & Elliot, 1998-2005: 3.

Other material examined. 61 ♀.

Diagnosis. A medium-sized, plump, metallic dark blue to blue-green species; related to *C. casuarinae* from which it is distinguished by the orange antennal flagellum and clear wings. Length 10–15 mm.

Female. Head. Eyes in life red, generally green on relaxation, bare. Frons narrow, slightly divergent, index 6–7, with delicate grey tomentum and sparse short black hairs, some on each side of middle of callus

and others below vertex; vertex slightly hollow; vertical triangle shiny, black, with numerous short black hairs; ocellar spot brown; callus shiny, black, almost full width of frons at base, oval and raised, with spear-shaped extension which is hollow below and forms raised ridge on upper half of frons, almost reaching ocellar spot. Subcallus smooth, with thin grey and brown tomentum, without hairs; parafacials rather narrow, with brownish black tomentum and short black hairs; face shiny, dark brown to black, with thin irregular tomentum on lower part at each side of base of proboscis, and short dark hairs below antennae, tentorial pits large and deep; beard black. Antennal scape and pedicel dark brown to blackish, with black hairs; flagellum bright orange-yellow, more reddish on basal plate and with blunt dorsal angle. Palpi slender, black, slightly shiny, with black hairs. Proboscis slender; labella with narrow, well-defined sclerotised bar laterally.

Thorax. Scutum and scutellum metallic dark blue to blue-green, with some greyish dusting anteriorly, hairs black. Pleura deep brown, with entirely black hairs.

Legs. Black, extreme tip of knees brownish yellow, hairs black; fore tibiae slightly swollen.

Wings. Base conspicuously dark brown, remainder pale greyish, almost clear; veins brown, distal part of R_1 , stigma and R_{4+5} paler.

Abdomen. Metallic blue-green to deep blue, with black hairs. Venter darker than dorsum, 8th sternite with gonapophyses wide, relatively shiny; spermathecal bulbs slender and little darker than ducts.

Distribution. From E of Mossman in NE QLD, S along the Great Dividing Range to Sydney NSW and west to Mudgee and Dubbo. **QLD:** Windsor Tablelands via Mt Carbine, Jan., I. Fanning; Hann Tableland Radar Station, Nov., G. B. Monteith and P. Bouchard; Wongabel Rd., via Atherton, Nov., D. Gibson; Hinchinbrook Is., Jan., S. Hamlet; Westwood, Oct., A. N. Burns; Mt Moffatt Nat. Pk., Nov. C. J. Burwell, Feb., S. G. Wright; Byfield, Jan., I. F. B. Common; Westwood, Oct., A. N. Burns; Blackland Tableland via Dingo, Dec., Maywald and Czechura; Port Curtis; Rosedale (Watalgan Ra.), Feb., H. Frauca; Kroombit Tops, 45 km SSW Calliope, Dec., G. B. Monteith and Thompson; Fraser Is., Feb., M. J. Mackerras; Eidsvold, Oct.–Nov., L. O. Bancroft, Dec., M. J. Mackerras, J. Bancroft; Biggenden (Bluff Ra. Foothills), Dec., H. Frauca; 64 km W of Maryborough; 33 km SW Tinnanbar, Dec., C. J. Burwell; Mary's Ck, at light, Dec., E. Britton and S. Misko; Tin Can Bay, July; Kilcoy, Oct.; Beerburrum, Jan., Smale; Amberley, Dec., H. A. Standfast; Greenbank, Nov., H. A. Standfast; Durikai, Feb., D. M. Spratt; Inglewood. **NSW:** 13 km W of Woolgoolga, Feb., T. G. Campbell; Bargibal No. 1 Bundarra, Dec., E. J. Waterhouse; Terry Hie Hie, Dec., M. J. Muller; Smith's Ck, Jan., B. McMillan; Kendall, Dec.–Mar.; 3 km N Lansdowne via Taree, Dec., G. & T. Williams; Dubbo, Dec.; Mudgee; Asquith, Jan., A. L. Dyce, Jan., M. J. Muller.

Remarks. Hardy (1929) assessed the validity of Tasmania as the type locality of four species of *Tabanus* described by Macquart (1850) in the fourth supplement of his *Diptères Exotiques*. Hardy quoted two statements by Ferguson on this matter: “The locality (Tasmania) given by Macquart is probably wrong, other records appear to be all from Sydney.” (Ferguson & Hill, Proceedings of the Linnean Society of New South Wales, xivii, 1922, 248). And, “The habitat (Tasmania) given by Macquart is to be doubted, as in the case of other species described from Tasmania, it is now known that they do not occur in that island but are found in the coastal districts of New South Wales and Queensland.” (Ferguson, Bulletin of Entomological Research, xiv, 1924, 261).”

Cydistomyia torresi (Ferguson & Hill)

(Fig. 15)

**Tabanus torresi* Ferguson & Hill, 1922: 257; Hardy 1939: 42, 1944: 83. Holotype female, Qld, Moa Island (syn. Banks Island), Torres Strait, Feb. 1921, McLennan (ANIC).

Cydistomyia torresi; Mackerras 1959: 166, 1964: 146, figs 103, 112, 115; Daniels, 1989: 288; Bickel & Elliot, 1998–2005: 4.

Cydistomyia nigerrima Oldroyd, 1949: 351, fig. 70; Mackerras 1964: 146 (syn. of *torresi* Ferguson & Hill). Type female,

New Guinea, Milne Bay, Feb. 1943, Mackerras (Not in ANIC, presumed lost).
Australian material examined. 6 ♀.

Diagnosis. This small species, length 11–13 mm, belongs to the Papuan *C. albithorax* group. Together with *C. danielsorum*, *C. palmensis* and *C. pseudoardens*, it represents a recent intrusion from New Guinea. Distinguished from *C. danielsorum* by the much longer extension on the callus, reaching upper and middle third of frons; palps black rather than fawn grey; absence of grey vitta with white triangles on abdominal tergites and venter black rather than pale grey. It is close to *C. palmensis* and similar in size, but distinguished by darker colouration of frons, antennae and legs, black palpi, quadrate shape of callus, long antennal scape, more conspicuous pale fringe around posterior half of thorax, and more conspicuous pale apical bands and lateral triangles on abdominal tergites.

Female. Head. Eyes (relaxed) dark brown with hint of green, bare. Frons brown, of variable but narrow width, index 5.0–5.8, tomentum at eye margins yellowish fawn, some golden hairs among dark ones above; vertex not hollow; vertical triangle ill-defined; ocellar tubercle not observed; callus deep brown, quadrate, with abrupt narrow blackish extension to junction of upper and middle third of frons, almost full width of frons at its base. Subcallus and top of parafacials brown, remainder of parafacials and face creamy white, with white hairs; beard creamy white. Antennae dark brown, scape and pedicel with dense black hairs, basal plate reddish orange, style almost black; antennal shape similar to *palmensis* except that scape is almost twice as long as wide. Palpi characteristically black, slightly shiny, with short black hairs.

Thorax. Scutum and scutellum brown, with dense fawn-yellow tomentum giving paler appearance to lateral margins, paler margins better defined than in *palmensis*, hairs mixed black and appressed cream to yellowish; scutellum much paler than in *palmensis*, pale hairs from wing root backwards and on scutellum relatively dense, greyish white, forming conspicuous fringe around posterior half of thorax. Pleura somewhat darker, creamy yellow above, greyish below.

Legs. Fore tibiae with basal third black, rather shiny; mid and hind tibiae mostly dark brown, hairs entirely black, except for some creamy ones below on hind femora.

Wings. Greyish to almost clear; costal cell conspicuously brownish yellow; sc and R₁ blackish, stigma bright brown, remaining veins dark brown, R₄ strongly angulate and may have vestige of appendix on one or both wings.

Abdomen. Tergites 1 and 2 brown, remainder blackish brown; tergites 2–6 with well-defined fawn-cream apical bands and small lateral triangles bearing creamy hairs; on 2nd tergite only a vague median triangle or vitta, remaining hairs on dorsum black. Venter black, with black hairs; sternites 2–6 with fairly uniform creamy fawn apical bands, bearing creamy white hairs, 7th sternite entirely dark.

Distribution. Known in Australia only from Torres Strait Islands QLD. QLD: Torres Strait, Moa Is., Nov., Feb., McLennan; Badu, biting, Apr., E.N. Marks; Horn Is., Dec., Houston and Sadler.

***Cydistomyia danielsorum* Mackerras & Spratt, sp. nov.**
(Fig. 16)

Type material. Holotype female, N Qld, Archer River crossing, “Wolverton”, Apr., 1989, G. & A. Daniels (AM). Paratype females (2), same data as for holotype; female, 3 km NW Archer River crossing, “Wolverton”, Apr., 1989, G. & A. Daniels; 2 females, 3 km SW Fox Creek crossing, “Wolverton”, Apr., 1989, G. and A. Daniels; 2 females, 26 km W Fairview, Apr., 1989, G. & A. Daniels (GDCB).

Non-type material examined. QLD 1♀ Jardine R, Cape York, 11.x.1979 M.S. and B.J. Moulds (GDCB); ? NT 2♀ Tenant’s Ck, J.F. Field (ANIC) (see Remarks).

Diagnosis. A small pale brown species with fine apical bands and a pale grey vitta with white hairs forming

median triangles on abdominal tergites, bulging shiny brown almost quadrate callus with fine anterior extension not reaching middle of frons, and brown antennae. Distinguished from *C. torresi* by much shorter extension of callus not reaching upper and middle third of frons, fawn grey rather than black palps and grey vitta with white triangles on abdominal tergites. Resembling a small *C. fergusonii* but with frons wider; callus bulging, shiny, almost quadrate with a very short extension; palps pale with scattered black hairs; and stigma conspicuous on clear wing. Length 10–12 mm.

Female. Head. Eyes (relaxed) green, bare. Frons parallel, wide, index 3.2–3.3, with fawn grey tomentum, fine black hairs; vertical triangle grey with short black hairs; ocellar tubercle ill-defined, raised, brown, anterior ocellus sometimes present; callus bulging shiny brown, nearly quadrate, almost full width of frons at base, with fine short extension not reaching middle half of frons. Subcallus with fawn-grey tomentum, no hairs. Parafacials and face with white tomentum, with fine white hairs; beard white. Antennal scape and pedicel grey, with black hairs; scape twice as long as wide, pedicel narrow with slight anterior extension; antennae orange brown, style slightly darker; basal plate stubby, with gently rounded dorsal angle. Palpi fawn grey, with scattered short black hairs.

Thorax. Scutum and scutellum uniformly grey, covered in short white hairs; mesonotum with long black hairs; pleura grey, with white hairs.

Legs. Femora pale greyish brown, with fine white hairs; tibiae similar but with black hairs; tarsi dark brown with black hairs.

Wings. Clear, with conspicuous brown stigma.

Abdomen. Brown with median pale grey vitta with white hairs forming median triangles on tergites 1–5, with fine pale bands with white hairs on apical margins of all tergites; other abdominal hairs black; venter uniformly pale grey with fine white hairs except sternite 7 darker, with long black hairs.

Distribution. From Cape York N QLD to S of Cooktown.

Etymology. The specific epithet is in honour of Greg and Alice Daniels and their enthusiastic collecting efforts in support of entomology in Australia.

Remarks. Two females from Tenant's Ck. NT (ANIC) are tentatively placed in this species in the absence of accurate knowledge of the locality (? Tennant Ck NT) and their occurrence in NT rather than Cape York QLD.

Cydistomyia palmensis (Ferguson & Hill)

(Fig. 17)

**Tabanus palmensis* Ferguson & Hill, 1922: 256; Hardy 1939: 42, 1944: 83. Type female, N Qld, Palm Island (ANIC)

Cydistomyia palmensis; Mackerras 1959: 166; Daniels, 1989: 287; Bickel & Elliot, 1998–2005: 4..

Tabanus nigropictus; Hardy, 1939: 42, nec Macquart, 1855: 44 (erroneously as syn. of *palmensis* Ferguson & Hill).

Other material examined. 97♀, 3♂.

Diagnosis. A medium-sized rather slender species with dark dorsum contrasting with much paler colour of pleura and venter, with brown antennae and legs, and faintly brown wings. Readily distinguished from similar species by almost shiny chocolate brown colouration, characteristically dark brown median lunulate markings contrasting with pale grey lateral areas on sternites, and conspicuous dark brown stigma. In addition, it is distinguished from *torresi* as noted under that species; from *C. pseudoardens* by more conspicuous pale median abdominal triangles, wings generally more prominently suffused with brown, and less robust basal plate with small dorsal sub-basal tooth on antennal flagellum; from *C. fergusonii* by dull scutum with little indication of vittae, conspicuous dark brown stigma, narrower frons with differently shaped callus, and narrower basal plate; and from *C. bancroftae* by conspicuous pale median abdominal triangles, dark brown stigma, narrow frons with conspicuous callus, and more typical rather than undersized antennae. Length 10–14 mm, usually

13–14 mm.

Female. Head. Eyes (relaxed) reddish green, bare, (with sparse fine hairs just visible at 35X magnification). Frons narrow, margins parallel or slightly convergent, index 5.4–5.7, covered with fawn-brown tomentum, paler along eye margins, with short dark hairs on darker part; vertex slightly hollow; vertical triangle greyish brown, with relatively dense short black hairs; ocellar tubercle irregular, oval, rather flat, surrounded by zone where tomentum is thin and frons slightly shiny; callus dark brown, shiny, slightly bulging, practically full width of frons at base, narrowing to tapered extension which reaches a little above middle of frons. Subcallus with greyish cream tomentum, brownish yellow above antennae, without hairs. Parafacials and face with greyish white tomentum and rather fine white hairs; beard white. Antennae bright brown, with style darker; scape about one and a half times as long as wide, with small dorsal prolongation and short black hairs; pedicel cup-shaped, with small dorsal prolongation and short black hairs; flagellum rather elongate, basal plate about one and a half times as long as style, with small but sharp dorsal tooth close to base. Palpi brownish grey, with short brown hairs.

Thorax. Scutum and scutellum dull brown, with faintly indicated dorsocentral lines in front of suture and more greyish lateral margins, hairs mixed black and creamy white, latter diffuse, not giving effect of pale posterior margin to thorax. Pleura pale grey, with white hairs.

Legs. Brown; fore femora and tibiae darker than others; all tarsi darkening to blackish brown; hairs preponderantly white on femora, black on remaining segments.

Wings. Lightly but distinctly and uniformly suffused with brown; veins chocolate brown; stigma shiny, chocolate brown, conspicuous.

Abdomen. Chocolate brown, darker than scutum, darker apically than on 1st and 2nd tergites; all tergites with narrow inconspicuous paler apical margins, tergites 2–5 with well-defined median white haired apical triangles; elsewhere hairs creamy white and conspicuous. Venter characteristic, predominantly grey on 1st sternite and lateral areas of sternites 2–6, dark brown colour reduced to wide lunulate median markings on sternites 2–6, hairs black on darker parts, creamy white on paler areas, entirely black on 6th and 7th sternites.

Male. Similar to female but more hairy, with thorax and abdomen more conspicuously marked and wings with less suffusion. Eyes with short fine hairs visible at X15 magnification, upper facets enlarged, reddish brown, contrasting with small lower and posterior dark ones. Ocellar tubercle raised slightly above eyes, ocelli not observed. Palpi fawn, second segment with mixed dark brown and white hairs. Thorax with more clearly defined dorsocentral and lateral vittae, with pale grey posterior margins on scutum and scutellum. Abdomen with broader pale apical margins on tergites, widening to form conspicuous median triangles on tergites 2–5.

Distribution. From Cape York N QLD S to Townsville, with a single southern record near Ipswich. **QLD:** Iron Range, Dec., S.J. Johnston; West Claudie R, Iron Range, Dec., G.B. Monteith and D. Cook; Shipton's Flat, 36 km S. Cooktown, Nov., D.K. Yeates; Bloomfield Rd via Helenvale, Oct., G.B. Monteith; Mt Finnigan summit, Nov., C.J. Burwell, Dec., G.B. Monteith; 1.5 km NW Cape Tribulation, Nov., G.B. Monteith; 3–5 km W Cape Tribulation, Sept., Dec., G.B. Monteith; Cape Tribulation, Dec., G. Daniels and M.A. Schneider, G.B. Monteith; Cooper Creek, 29 km N Daintree River, Nov., T. Weir; 2 km SSE Mt Spurgeon, Nov., C.J. Burwell; 7.5 km and 4 km NW Kuranda, Jan., Feb., Storey and Halfpapp; Cairns, Edge Hill, Dec., C.F. Ashby; Cairns, F.H. Taylor; Meringa, Nov., G.M. Goldfinch; Kauri Ck, Tinaroo, Dec., D. Gibson; Upper Mulgrave R., Gordonvale, Apr., S.R. Curtis; Mt Edith, 1036 m, Mar., I.F.B. Common and M.S. Upton; Atherton, Jan., G. Etter Shank; Station Creek, Nov., C.J. Burwell; Mt Lewis Rd 29 km from highway, Nov., C.J. Burwell; Bellenden Ker Ra, Oct.; The Boulders via Babinda, Dec., B. Cantrell; Henrietta Ck, Palmerston Nat. Pk, Apr., S.R. Curtis, Sept., H.A. Standfast and A.L. Dyce; Bartle Frere, Nov., D. Elliott; Ninos Ck, Innisfail, Mar., H.A. Standfast; Gooligan Ck, nr Innisfail, Apr., R. Domrow; Boulder Creek via Tully, Oct., G.B. Monteith; 40 km W of Tully, Mar., I.F.B. Common and M.S. Upton; Mission Beach, Nov., G.B. Monteith; Gayundah Ck, Hinchinbrook Is., Nov., G.B. Monteith and D. Cook; Palm Is., Nov.-Dec., A. Breinl, Dec.-Jan., I.M. and M.J. Macker-

ras; Mt Spec, 305 m, Jan., P. Ferrar, Apr., K.L.S. Harley; Little Crystal Ck, Mt Spec, biting, Nov., Dec.; Mt. Halifax, 45 km W Townsville, Dec., Jan., A. Graham; Kholo, nr Ipswich, Dec., M. Colbo.

The last very southern record (Kholo, nr Ipswich) is surprising but the specimen bears all the characteristic morphological features of the species.

***Cydistomyia pseudoardens* (Taylor)**

(Figs 9, 18)

**Tabanus pseudoardens* Taylor, 1913: 66; Austen 1914: 265; Ricardo 1915a: 272, 1917: 219; Ferguson 1916a: 206, 1921a: 372; Surcouf 1921: 80. Type female, N Qld, Kuranda (ANIC).

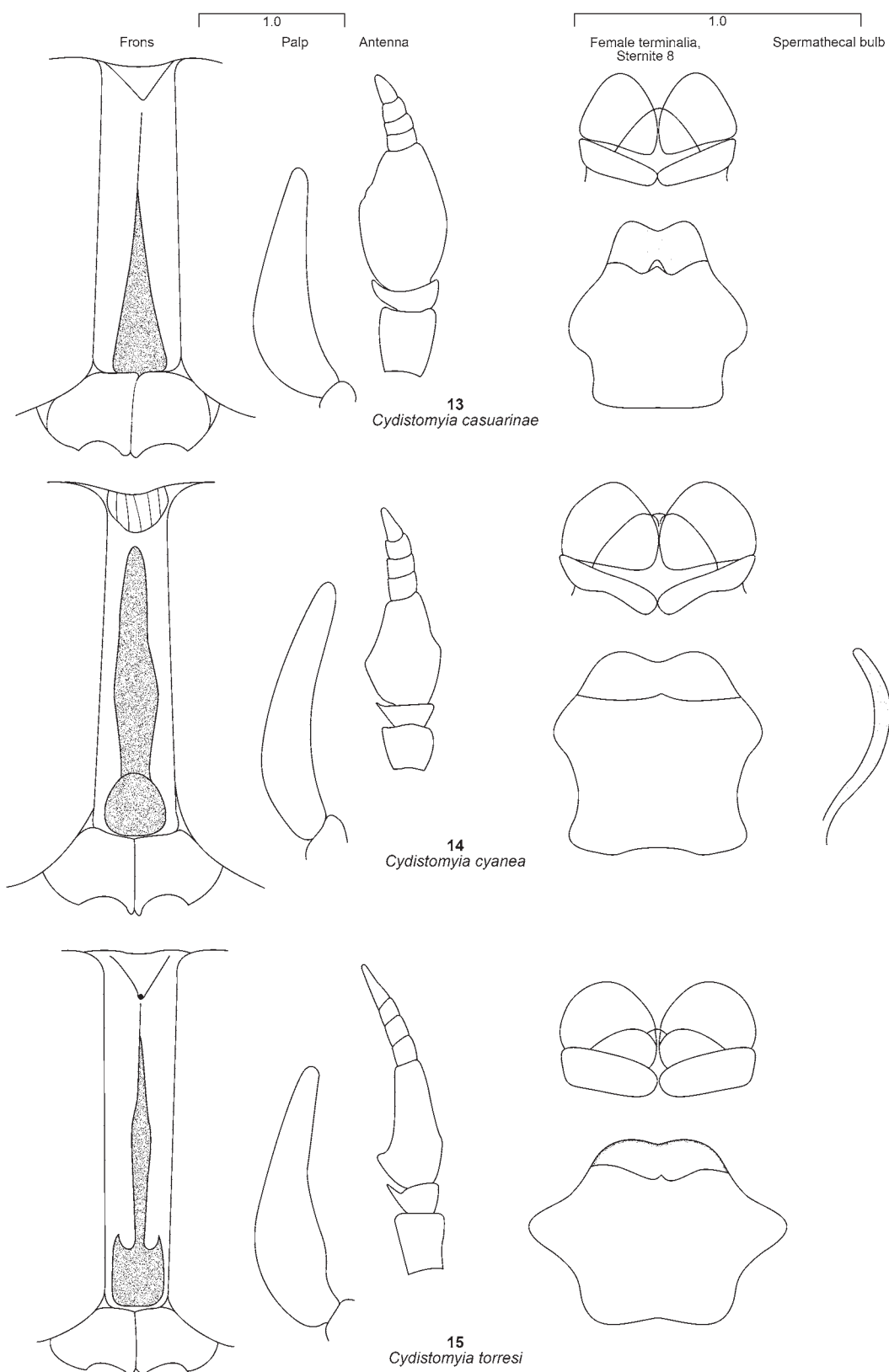
Cydistomyia pseudoardens; Mackerras 1959: 166; Daniels, 1989: 287; Bickel & Elliot, 1998-2005: 4.

Other material examined. 561 ♀, 11 ♂.

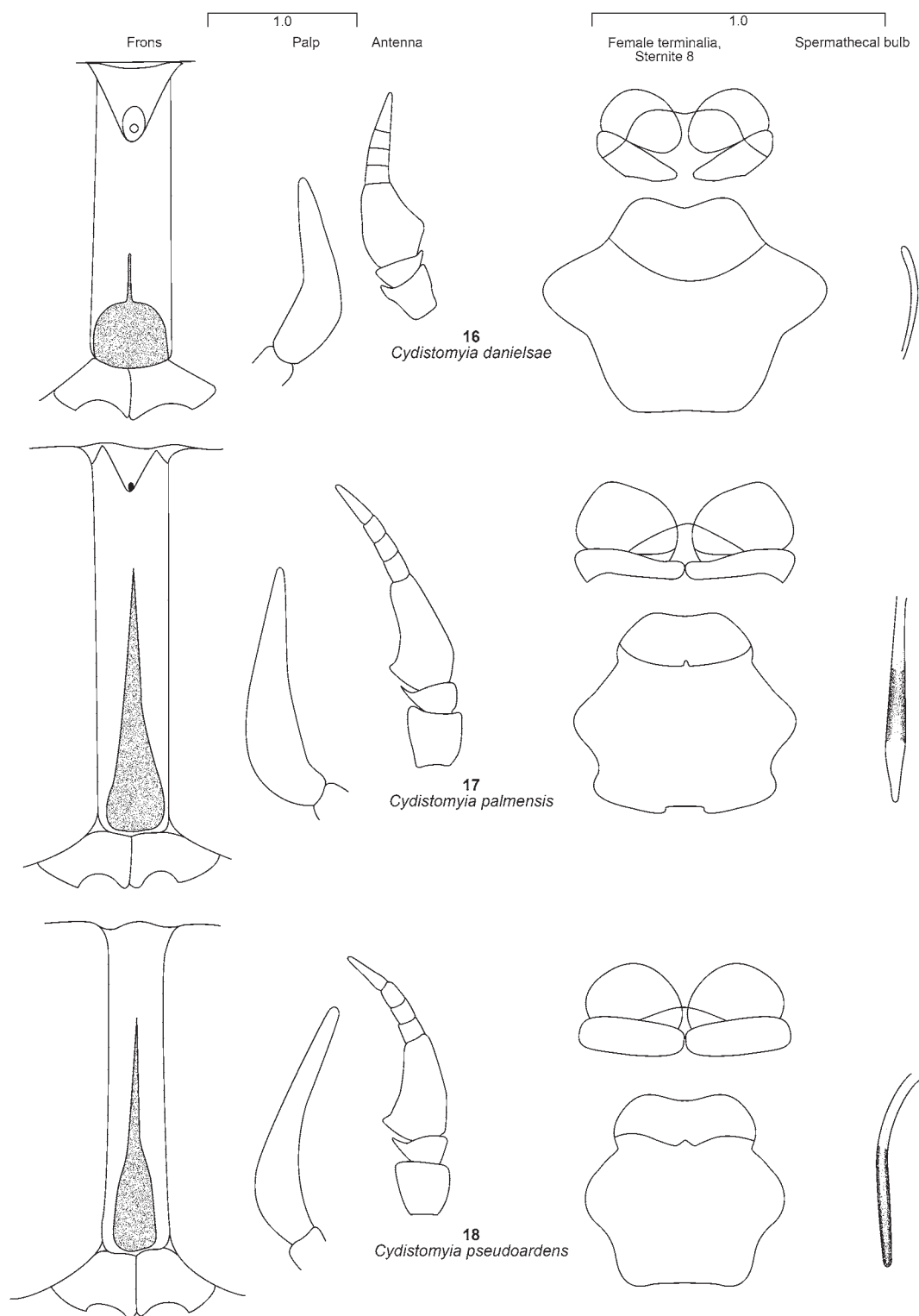
Diagnosis. A medium-sized rather slender brown species, the dark dorsum contrasting (as in *C. palmensis*) with much paler colour of pleura and venter. Derived from Papuan stock although not as close to *C. lorentzi* (Ricardo) as originally believed (Mackerras 1959). Varying toward *C. palmensis* from which it is distinguished by features listed under that species; distinguished from *C. fergusoni* by less ornamented appearance, lack of clear vittae on scutum, and conspicuous pale apical margins and median triangles on abdominal tergites, by absence of ocellar tubercle, narrower frons with paler brown and differently shaped callus not extending full width of frons at base, and more brightly coloured antennae; from *C. bancroftae* by much paler colouration, particularly on scutum, narrow frons with conspicuous callus, more typically shaped and brightly coloured antennae; and from *C. avida* by smaller size, more uniformly brown abdominal colouration, less brown suffusion on wings, narrower frons, and characteristic callus and basal plate of antennal flagellum. Length 11–14 mm.



FIGURES 9–12. Antennal flagella: **9.** *Cydistomyia pseudoardens* (Taylor), **10.** *Cydistomyia bancroftae* Mackerras, **11.** *Cydistomyia improcerus* Mackerras & Spratt, **sp. nov.**, **12.** *Cydistomyia victoriensis* (Ricardo).



FIGURES 13–15. 13. *Cydistomyia casuarinae* (English, Mackerras & Dyce) frons, palp, antenna, female terminalia, sternite 8. 14. *Cydistomyia cyanea* (Wiedemann) frons, palp, antenna, female terminalia, sternite 8, spermathecal bulb. 15. *Cydistomyia torresi* (Ferguson & Hill) frons, palp, antenna, female terminalia, sternite 8.



FIGURES 16–18. 16. *Cydistomyia danielsorum* Mackerras & Spratt, **sp. nov.** frons, palp, antenna, female terminalia, sternite 8, spermathecal bulb. 17. *Cydistomyia palmensis* (Ferguson & Hill) frons, palp, antenna, female terminalia, sternite 8, spermathecal bulb. 18. *Cydistomyia pseudoardens* (Taylor) frons, palp, antenna, female terminalia, sternite 8, spermathecal bulb.

Female. Head. Eyes (relaxed) reddish green in life sometimes greenish, bare, (sparse fine hairs just visible at 35X magnification). Frons narrow, parallel or slightly convergent, index 4.7–6.4, with fawnish brown tomentum, paler along eye margins and with short dark hairs; vertex slightly hollow; vertical triangle greyish

brown, with short black hairs; ocellar tubercle irregular, oval, flat, sometimes with three vestigial ocelli; callus dark brown, shiny, distinctly bulging, a little less than width of frons at base, with tapered extension that reaches approximately to middle of frons. Subcallus with fawn grey tomentum, without hairs; parafacials and face with greyish tomentum, with fine black and white hairs; beard creamy white. Antennal scape about one and a half times as long as wide, with small dorsal prolongation, fawn with black hairs; pedicel cup-shaped, with small dorsal prolongation, fawn with black hairs; flagellum elongate, basal plate more robust than *palmensis*, slightly longer than style, with well-defined almost median dorsal angle, orange-brown, contrasting with blackish style. Palpi fawnish grey, with short black hairs.

Thorax. Scutum and scutellum dull brown, with faintly indicated dorsocentral lines in front of suture, lateral margins greyish, hairs mixed black and creamy white, the latter diffuse. Pleura grey, with white hairs.

Legs. Brown, with black hairs on fore femora, white hairs on others; tarsi blackish brown, with black hairs.

Wings. Lightly suffused with brown; marginal cell and costal half of first submarginal cell darker than others; veins brown; stigma brown.

Abdomen. Brown, darker than scutum but not as chocolate brown as *palmensis*, generally darker on apical tergites than on tergites 1–3; all tergites with narrow inconspicuous pale apical margins, poorly defined median white-haired apical triangles on tergites 2–5, hairs conspicuous creamy white on narrow grey zone at lateral corners of tergites 2–5, elsewhere hairs black. Venter light brown on 1st and 2nd sternites, darker brown on sternite 3–6, pale grey apical band on sternites 2–6; hairs dark on darker parts, creamy white on paler areas, predominantly black on 7th sternite.

Male. Similar to female but more hairy. Eyes bare (few short fine hairs just visible at 35X magnification), with enlarged reddish brown upper facets contrasting with darker brown small lower and posterior facets. Ocellar tubercle sunken below eyes, ocelli not observed. Palpi light brown, second segment with dark brown and few white hairs. Wing with more brown suffusion, costal and first basal cell darker than others. Flagellum less robust, particularly basal plate, tending towards short dorsal tooth rather than well-defined dorsal angle.

Distribution. From Cape York N QLD SE to Townsville. **QLD:** Cape York; Packer Creek 4 km SW Portland Roads, Dec., D. K. Yeates; West Claudie R., Dec., G. Daniels and M.A. Schneider; Iron Range, Cape York Peninsula, Nov., G.B. Monteith; Claudie R., Iron Range; Mt Finnigan, Dec.-Jan.; Mt Boolbun South, Nov., G.B. Monteith; Mt Halcyon, Nov., G.B. Monteith; Cape Tribulation, Sept., Oct., Dec., Jan., G.B. Monteith; Sept. Oct. E.N. Marks; Noah Ck 8 km S Cape Tribulation, Sept., Oct., G.B. Monteith; Mossman Gorge, Oct., E. Britton; Port Douglas, C.J. Wild; Mossman Bluff, 5–10 km W Mossman, Dec.-Jan., G.B. Monteith; Mt Windsor Tablelands via Mt Carbine, Dec., E. Schmidt, D. Gibson, Jan., I. Fanning; 2.5 km N Mt Lewis via Julatten, Nov., D.K. Yeates; Mt Lewis, 914 m, Oct., E. Britton, Dec., rainforest, at light., E. Britton and S. Misko; Mt Lewis Road, 16 km from highway, Dec.-Jan., G.B. Monteith; Pretty Beach, Jan., E.C. Dahms; Mt Formartine South, 10 km N Kuranda, Nov., G.B. Monteith and G. Thompson; Kuranda, Nov., H.E. Evans, R.L. Heilscher, F.H. Taylor, Dec., Hale and N.B. Tindale, Jan., P. Ferrar, P. Carne and E. Britton, F.P. Dodd; 7.5 km W Kuranda, Feb., Storey and Halfpapp; Lake Placid, Oct., E. Britton; Cairns, Nov., A.L. Dyce, Jan., P. Carne and E. Britton, on horse, J.F. Illingworth, F.E. Wilson; 13 km along Davies Road via Mareeba, Dec., Storey and Brown; Meringa, Sept., 6 m Goldfinch; Pine Ck, nr Gordonvale, Jan., P. Carne and E. Britton; Mulgrave R., Oct., A.N. Burns; Yungaburra, Jan., P. Ferrar; Lake Barrine, Yungaburra, Jan., P. Ferrar; Gargarra State Forest, 10 km E Lake Eacham, Dec., Monteith; Bramston Beach, Sept., I.M. Mackerras, Oct., D. Elliott; Forest Rd., Danbulla SF, Nov., D. Gibson, Jan., D. Gibson and E.J. Harris; Bellenden Ker Ra, Oct.-Dec., G.B. Monteith; Atherton, Jan., D. Gibson; Kairi Res. Stn., Atherton, Dec., E.J. Harris; Mt Babinda, Mar., I.M. Mackerras; Russell R., Babinda, Mar., I.M. Mackerras; Bartle Frere, Nov., D. Elliott; Mt Misery Road, Jan.; Onglands Gap, Jan., P. Carne and E. Britton; Innisfail, Nov., P. Ferrar, Fahey, F.H. Taylor; Fisher Ck, Innisfail, Oct., I.M. Mackerras; Ninds Ck, Innisfail, Feb., H.A. Standfast and B. Kay; Gooligan Ck, nr Innisfail, Apr., R. Domrow; Downey Ck 25 km SW Millaa Millaa, Dec., G.B. Monteith and G. Thompson;

Mourilyan, Oct., A.L. Dyce; Cowley, nr Innisfail, Nov.; Silkwood, Oct.; Palmerston Nat. Pk., Nov., K.L.S. Harley; Crawford Lookout, Palmerston Nat. Pk., Jan., P. Ferrar, Oct.; Henrietta Ck, Palmerston Nat. Pk., Jan., P. Ferrar; Beatrice R., Oct.-Nov., I.M. Mackerras; Kennedy via Cardwell, Oct., D. Gibson; Cardstone, Jan., P. Carne and E. Britton, Feb., K. Hyde; Dunk Is., Jan., Banfield; Mission Beach, Tully, Sept., R.J. Huppatz and K.L.S. Harley; Palmerston Highway, Tully, Feb., D. Gibson; 8 km E Tully, Feb., P. Ferrar; Tully, Oct.; 40 km W Tully, Mar., I.F.B. Common and M.S. Upton; Upper Boulder Ck via Tully, Oct., G.B. Monteith; South Mission Beach and Tully Mission Beach Roads, Sept., J. and A. Skevington; Gayundah Ck, Hinchinbrook Island, Nov., G.B. Monteith; Little Crystal Ck, Mt Spec, Nov., E.N. Marks, Nov.-Dec., M.J. Mackerras; Townsville, Dec.

***Cydistomyia fergusonii* Mackerras & Spratt, sp. nov.**

(Fig. 19)

Type material. Holotype female, NSW, Asquith, Jan. 1963, A.L. Dyce (ANIC). Paratypes, same data but collected Dec. 1968, 1970, (ANIC).

Non-type material examined. **QLD:** 1♀ Sunday Ck Jimna SF, 18.ii.1999, G. Daniels (GDCB); 1♀ Mt Nebo, xii.1957, E.H. Derrick (ANIC); 1♀ Coomera R. nr Canungra, 25.xii.1923, A. Musgrave (AM); 5♀ Mt Mistake, nr Laidely, 12.i.1971, D.M. Spratt (ANIC); 1♀ Darlington, 11.ii.1957, F.A. Perkins (ANIC); 1♀ Springbrook, 1.xii.1949, I.M. and M.J. Mackerras (ANIC); 1♀ Lamington Nat. Pk., H.J. Carter (ANIC). **NSW** 1♀ Basket Swamp Falls, Boonoo SF nr Tenterfield, 10.xii.2003, 1♀ 3.i.2004, G. and A. Daniels (GDCB); 2♀ Cloud Ck and West Camp, Clarence R., 12-14.i.1926 (ANIC); 1♂ Bruxner Park nr Coffs Harbour, 22.i.1971, D.K. McAlpine (AM); 1♀ Nymboida R., nr Dorriggo, 9.i.1952, I.M. and M.J. Mackerras (ANIC); 2♀ Mt Drummond, 14.xi.1957, F.A. Perkins (ANIC); 3♀ Barrington Tops, 13-17.xii.1939, G.M. Goldfinch (ANIC); 1♀ Eccleston, i.1928, M.E. Fuller (ANIC); 2♀ Upper Allyn R., 14.ii.1968, D.H. Colless (ANIC); 2♀ Mill, Allyn R., 18.xii.1922, G.M. Goldfinch (ANIC); 1♀ Hawkesbury R., 13.xii.1923 (ANIC); 1♀ Milson Is., Hawkesbury R., 14.x.1921, J.B. Cleland (ANIC); 1♀ Upper Allyn nr Eccleston, 16.ii.1967, D.K. McAlpine (AM); 5♀ nr Cutler's Pass, Williams R., 10.i.1943, A. Musgrave (AM); 1♀ Mooney Mooney Ck, nr Gosford, 12.xii.1978, D.K. McAlpine & B.J. Day (AM); 3♀ McCarr's Ck, 7-12.i.1971, E. Gross (ANIC); 1♀ Kurrajong, 7.ii.1902, Musson (ANIC); 1♀ Broken Bay, 31.xii.1923, I.M. Mackerras (ANIC); 1♀ Govett's Ck, 31.i.1953, B. McMillan (ANIC); 1♀ Grose R., Blue Mtns, i-ii.1953, M. Henry (ANIC); 1♀ Blackheath, 1.ii.1926, I.M. Mackerras (ANIC); 2♀ Mt Ku-ring-Gai, 30.xii.1951, B. McMillan (ANIC); 2♀ Wahroonga, xii.1925, Galston (ANIC); 2♀ i.1926, Wood (ANIC); 2♀ Dee Why, i.1928, M.E. Fuller (ANIC); 1♀ Nepean R., i.1932, A. Musgrave (AM); 1♀ Wentworth Falls, Blue Mtns, 2.ii.1954, D.K. McAlpine (AM); 3♀ Sydney, 26.xii.1962, Reese (ANIC); 1♀ Middle Harbour, 23.i.1926 (ANIC); 1♂ Royal Nat. Pk., 28.xii.1970, D.K. McAlpine (AM); 1♀ Otford, Royal Nat. Pk., 31.i.1961, D.H. Colless (ANIC); 3♀ Werong, Royal Nat. Pk., 26.i.1979, R. Eastwood (GDCB); 1♀ National Falls, Royal Nat. Pk., 7.ii.1978, G. Daniels (GDCB); 1♀ Cabramatta, 10.i.1960, M.I. Nikitin (ANIC); 1♀ Heathcote, 5.i.1952, B. McMillan (ANIC); 1♀ Colo Vale, 25.i.1956, A.K. O'Gower (ANIC), 1♀ 10.ii.1955, A.L. Dyce (ANIC), 1♀ 8.ii.1954 G. Sackelarion (ANIC), 1♀ 5.ii.1956, D.J. Lee and A.L. Dyce (ANIC); 1♀ Engadine nr Sydney, 31.i.1979, P. Heilman (GDCB).

Diagnosis. A medium-sized brown species, superficially resembling *Dasybasis circumdata* (Walker), but generally paler, with bare eyes, narrower frons, usually clear indications of ocelli, differently shaped callus; and vein R₄ without appendix. Distinguished from *C. palmensis* and *C. pseudoardens* as noted under those species. Readily distinguished from *C. bancroftae* by its paler brown colouration, absence of brown suffusion on costal cell and wing veins, narrower frons, conspicuous callus extending full width of frons at base, and longer more slender antennae. Length 11–14 mm.

Female. Head. Eyes (relaxed) reddish brown, bare, (fine sparse hairs visible at 35X magnification). Frons medium, parallel, index 3.7–4.4, with dark brown tomentum, paler on eye margins, with short dark hairs on darker part; vertex slightly hollow, vertical triangle grey, with relatively dense short hairs; ocellar tubercle well defined, usually with three flat but definite ocelli; callus pyriform, bulging, shiny, brown, nearly full width of frons at base, with tapered extension that reaches to slightly above middle of frons. Subcallus smooth, with greyish white tomentum, yellowish above antennae, without hairs; parafacials and face greyish

white, with white hairs mixed with some black ones above and below; beard greyish white. Antennae slender; scape distinctly longer than wide, with well-marked dorsal hood, with greyish tomentum and short black hairs; pedicel cup-shaped, with dorsal prolongation, brown with black hairs; basal plate brown, narrow, with small but sharp sub-basal dorsal angle; style chocolate brown. Palpi thin, tapered to fine point, with relatively long creamy hairs basally above and below, dark brown ones more distally.

Thorax. Scutum and scutellum brown with greyish hue, hairs black and creamy white, without well marked tufts or zones. A narrow dark median line and the sublateral ground colour which is darker olive-brown than the median area, give the appearance of two broad, widely separated darker vittae on a relatively pale scutum. Pleura light grey, with greyish white hairs, few darker ones on upper mesopleural convexity.

Legs. Femora brown, with greyish overlay, hairs greyish white, anterior surface of fore femora shiny mahogany brown, with black hairs; remaining segments darker brown, darkening to blackish on tarsi, with black hairs.

Wings. Uniformly pale greyish; veins brown; stigma inconspicuous relative to previous two species, brown.

Abdomen. Cinnamon brown, with dark brown to black hairs. Apical margins well defined, paler brownish grey; tergites 2–5 with median triangles bearing creamy white hairs. Venter brownish grey, darker in centres of sternites, paler on apical edges, hairs black on darker centres, creamy white elsewhere.

Male. The male of this species remains in question as none have been collected with characteristic females. However, two specimens are at hand which, although differing somewhat, may be males of *C. fergusonii*.

Mt Waring specimen: Similar to female but with more conspicuous pale median triangles on abdominal tergites and less conspicuous vittae on scutum due to dense covering of erect long dark brown hairs on scutum and scutellum. Eyes bare, (few scattered short hairs just visible at 35X magnification), with upper facets enlarged, reddish brown, contrasting with small darker lower and posterior facets. Ocellar tubercle not observed. Antennae missing. Face greyish white with black hairs. Beard dark brownish black. Palpi with fawn tomentum, with long dark brown hairs. Legs almost uniformly brown, fore tibiae darker brown, with long mixed white and brown hairs on femora, short dark brown hairs elsewhere.

Hornsby specimen: A worn and rubbed male specimen differs from the above as follows: ocellar tubercle present, greyish brown, elongate, sunken below level of eyes. Antennal scape and pedicel dark brown with slight dorsal prolongations, with few dark brown hairs; basal plate of flagellum amber-brown, with gentle dorsal angle, style darker brown. Face more grey; palps grey with paler hairs.

Distribution. SE QLD from the Brisbane region to the Sydney area NSW and west to the Blue Mountains.

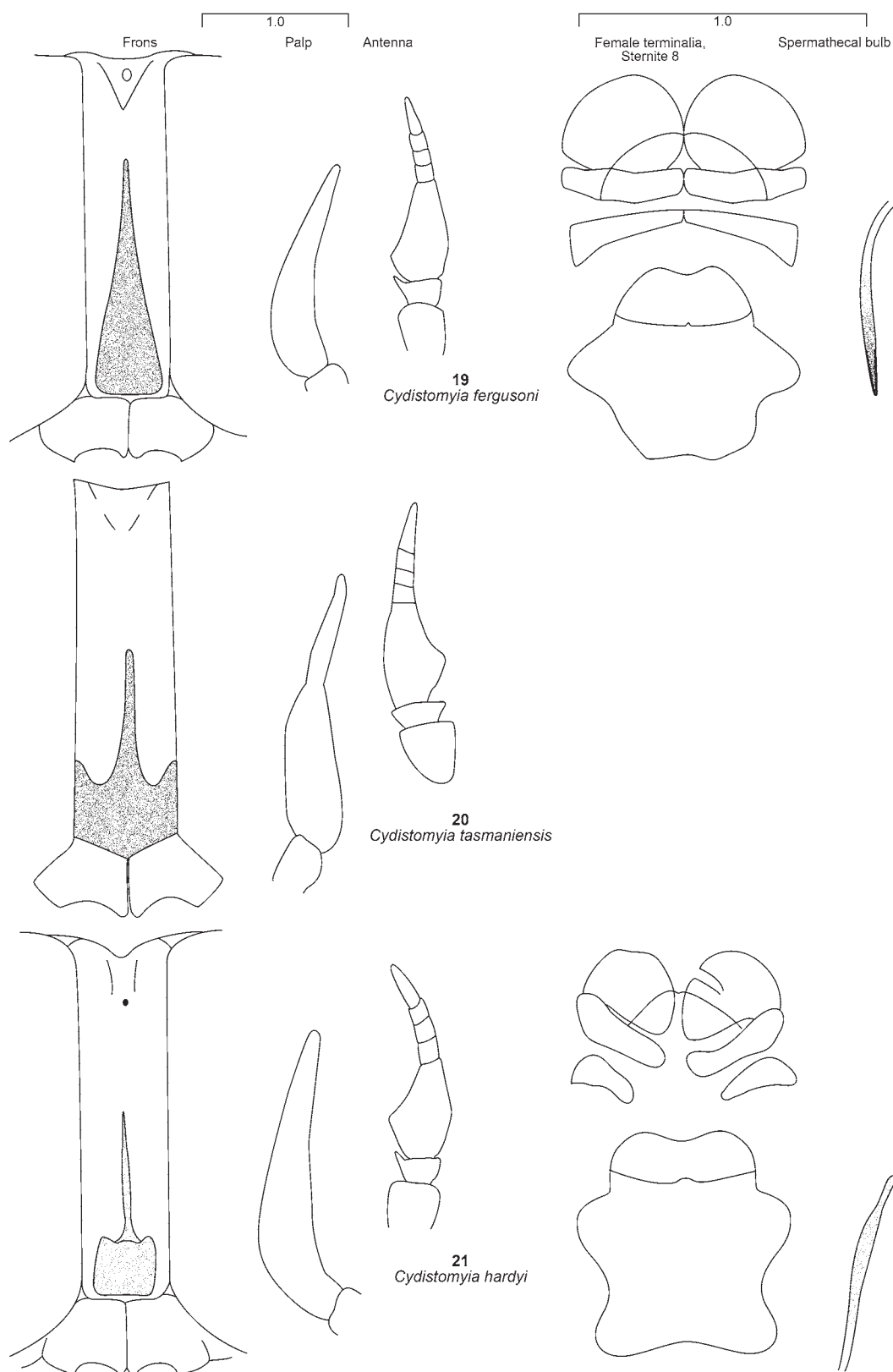
Etymology. The specific epithet is in honour of the late Dr E.W. Ferguson, former Director of Public Health in NSW, for his contribution to knowledge of Tabanidae in Australia.

***Cydistomyia tasmaniensis* Mackerras & Spratt, sp. nov.**

(Fig. 20)

Type material. Holotype female, Tas, from 3 km NW of Exton, Feb., A.I. Knight (AM)

Diagnosis. A medium-sized grey species with vittate scutum, broad pale apical margins on abdominal tergites and conspicuous pale triangles on tergites 2–4 and with shiny, dark quadrate callus with short narrow lateral extensions and narrow median extension to middle of frons. Length 14 mm. This represents the only species and specimen of the genus *Cydistomyia* known from Tasmania.



FIGURES 19–21. 19. *Cydistomyia fergusonii* Mackerras & Spratt, **sp. nov.** frons, palp, antenna, female terminalia, sternite 8, spermathecal bulb. 20. *Cydistomyia tasmaniensis* Mackerras & Spratt, **sp. nov.** frons, palp, antenna. 21. *Cydistomyia hardyi* Mackerras & Spratt, **sp. nov.** frons, palp, antenna, female terminalia, sternite 8, spermathecal bulb.

Female. Head. Eyes (relaxed) reddish black, with dense short hairs. Frons medium, parallel sided, index 3.9. With light grey tomentum with dense long black hairs; vertex not hollow, vertical triangle greyish black

with long black hairs; ocellar tubercle inconspicuous; callus shiny, brown, quadrate with short narrow lateral extensions and narrow median extension to middle of frons. Subcallus with fawn brown tomentum without hairs; parafacials and face with cream tomentum and scattered short brown hairs; beard creamy white. Antennal scape and pedicel pale brown with long black hairs, pedicel with short anterior prolongation; basal plate bicoloured, pale brown basally, dark brown apically, with gentle dorsal angle, style dark brown. Palpi fawn with few scattered short black hairs dorsally and on distal tips, denser long white hairs laterally and ventrally.

Thorax. Scutum grey with broad dorsocentral, two lateral and two posterolateral slate grey vittae, well covered in relatively long pale white and brown hairs; notopleural lobe and mesopleuron fawn brown with black hairs. Scutellum slate grey with long pale white hairs. Pleura grey with scattered pale white hairs.

Legs. Femora grey with mixed short black and white hairs; tibiae and tarsi dark brown with short black hairs.

Wings. Clear, stigma pale brown.

Abdomen. Dark brown with broad pale grey apical margins on tergites and conspicuous pale grey triangles on tergites 2–4, margins and triangles with short white hairs, elsewhere hairs short, dark brown. Venter mahogany brown with dark median lunulate markings contrasting with paler lateral areas on sternites 2–5, more uniform dark greyish brown on tergites 6–7.

Distribution. Known only from type locality in N central TAS.

***Cydistomyia hardyi* Mackerras & Spratt, sp. nov.**
(Fig. 21)

Type material. Holotype female, NSW, Katoomba, Dec. 1949, G.H. Hardy (ANIC).

Non-type material examined. 2♂, 2♀ Clarence, Blue Mtns, 17 & 21.i.1979, 1♂ 20.i.1984, NW Rodd (AM); 2♂, 1♀ Bell, Blue Mtns, 15.i.1980, NW Rodd (AM); ♀ Flagstaff Hill, Blue Mtns, 19.i.1979, NW Rodd (AM); 1♀ NSW, Blackheath, Feb., R. Eastwood (ANIC).

Diagnosis. A distinctive large robust brown species close to *fergusoni* but distinguished from it by larger size, pale yellowish brown pear-shaped callus, absence of ocellar tubercle, ill-defined apical margins but conspicuous median triangular markings on abdominal tergites, and grey venter. Length 16 mm.

Female. Head. Eyes (relaxed) blackish, bare, (fine sparse hairs visible at 35X magnification), somewhat shiny. Frons rather narrow, index 4.0, distinctly bulging, with brown tomentum over most of area, light creamy fawn on eye margins, with short dark hairs; vertex hollow, vertical triangle poorly defined, no ocellar tubercle nor spot; callus pale yellowish brown, pear-shaped, about two-thirds width of frons at base, tapering to narrow extension which reaches to about middle of frons. Subcallus smooth, light fawn, with several short dark hairs on one side above antennae; parafacials and face with pale creamy grey tomentum, parafacials with fairly dense short black hairs, face almost bare, with small group of black hairs on each upper lateral corner and one or two below antennae; beard white. Antennal scape slender, pale fawn-cream with black hairs; pedicel cup-shaped, with dorsal prolongation, slightly darker than scape, with short black hairs; basal plate reddish brown, dorsal angle well developed, forming small knob; style darker reddish brown, almost black apically. Palpi creamy, with black hairs. Labella with narrow, rather weak, chitinated bar.

Thorax. Scutum and median area of scutellum light dull brown with faint yellowish hue, dorsocentral lines vaguely and anterior margins more definitely greyish, sublateral areas darker brown, interrupted at suture; lateral zone lighter, with dark mark above wing root; hairs predominantly black, with patch of white behind wing root, dull yellowish cream in front of scutellum, more creamy on apical margin. Pleura pale ashy grey, contrasting strongly with darker scutum, with relatively long dense white hairs, mixed with some black ones on mesopleura.

Legs. Anterior femora bright brown with black hairs, mid and hind pale yellowish brown with black and

white areas; tibiae and tarsi yellowish brown, fore legs somewhat darker than mid and hind; all segments with black hairs mixed with some yellowish cream ones on anterior surface of hind tibiae and some short reddish brown ones ventrally on hind tarsi.

Wings. Somewhat greyish, with a little brownish darkening in costal cell; veins light brown; sc with sparse and irregular setulae above, normally setulose below.

Abdomen. Brown, darker than thorax, darker on third and subsequent tergites than on first two; pale apical margins of tergites barely indicated, somewhat paler median triangles on tergites 2–5; hairs on disc black, yellowish cream on median triangles, irregular on apical edges. Venter grey, slightly darker in middle, contrasting with dorsum in same way that pleurae contrast with scutum; sternites with narrow conspicuous creamy white apical edges; hairs white, black on median section of sternites.

Male. Similar to female generally, venter more yellowish brown than grey. Eyes bare, with upper facets enlarged, reddish brown, contrasting with small lower and posterior facets, also reddish brown. Antennae similar to female, slightly paler third antennal segment, narrower and with less well-developed dorsal angle. Parafacials with creamy tomentum with moderately long dense black hairs, face bare. Beard white. Palpi with fawn tomentum with long mixed black and white hairs. Legs almost uniformly brown with long fine mixed black and white hairs.

Distribution. Known only from the Blue Mountains, NSW.

Etymology. The specific epithet is honour of G.H.H. Hardy, for his contribution to knowledge of Australian Diptera.

***Cydistomyia bancroftae* Mackerras**
(Figs. 10, 22)

**Cydistomyia bancroftae* Mackerras, 1964: 66, figs 1–6; Daniels 1989: 286; Bickel & Elliot, 1998–2005: 3. Holotype female and paratype male, S Qld, near Killarney (ANIC).

Other material examined. 56 ♀, 7 ♂.

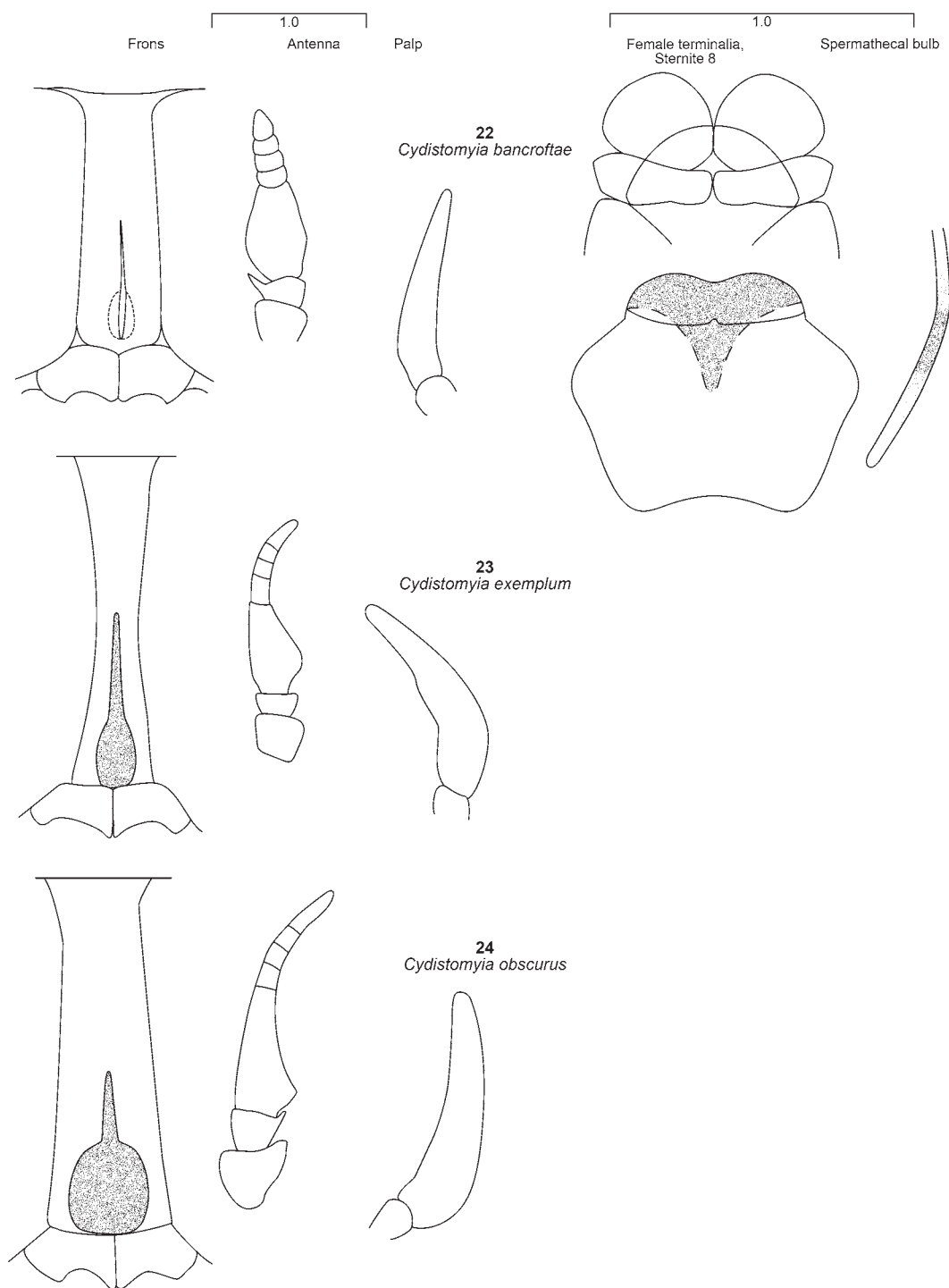
Diagnosis. A medium-sized dimorphic species with dark chocolate brown and paler brown females, and light yellowish brown males. A highly characteristic *Cydistomyia* with relatively wide frons and parafacials, greatly reduced and indistinct linear callus, primitive short stubby antennae, and drab rather plain appearance of females. Length 12–14 mm.

Female (dark form).

Head. Eyes in life green, bare (short scattered hairs visible at 35X magnification). Frons medium, slightly divergent, index 3–4, dull brownish grey, with short black hairs; vertical triangle darker brown, ocellar spot small and irregular; callus dark brown, narrow, irregular, relatively inconspicuous, not extending beyond middle of frons. Subcallus, parafacials, and face dull brownish grey; subcallus pouting, with few dark hairs at sides; parafacials and face with short black hairs, mixed with some paler ones on lower part of parafacials; beard sparse, mixed black and dull brownish grey. Antennae of primitive form, short and stubby, with blunt or rounded dorsal angle; scape and pedicel dull fawn-brown, with short black hairs; flagellum brownish basally, darkening to blackish on distal part of basal plate and style, basal annuli of style sometimes compacted and difficult to distinguish. Palpi rather slender, bluntly pointed, dull fawn brown, with short black hairs.

Thorax. Scutum and scutellum mummy-brown, with traces of darker dorsocentral vittae, hairs almost uniformly black, except for some inconspicuous pale ones apically on scutum and marginally on scutellum. Pleura concolorous, with black hairs, except for some greyish white ones below and behind wing-root.

Legs. Brownish black, with black hairs, except for paler basal three-fourths or more of tibiae bearing admixture of dull cream hairs.



FIGURES 22–24. 22. *Cydistomyia bancroftae* Mackerras frons, antenna, palp, female terminalia, sternite 8, spermathecal bulb. 23. *Cydistomyia exemplum* Mackerras & Spratt, **sp. nov.** frons, antenna, palp. 24. *Cydistomyia obscurus* Mackerras & Spratt, **sp. nov.** frons, antenna, palp.

Wings. Greyish, costal cell brown; veins brown basally, blackish on apical two-thirds, vague blackish suffusion along R_{2+3} and R_{4+5} , stigma dark brown, R_4 evenly curved, with slight thickening in position of appendix.

Abdomen. Deep almost blackish brown, with black hairs on discs of all tergites, narrow lighter brown cream-haired apical margins on tergites 2–5 or 6, pale hairs tending to extend irregularly forward in median zone of tergites 2–4. Venter similar, but pale hairs on apical margins of sternites fewer. Terminalia dorsoven-

trally compressed; with distinctive pattern of pigment on distal part of 8th sternite.

Pale female. Distinguished from dark form by following features: parafacials and palpi with entirely yellowish cream hairs; beard yellowish cream; antennal plate often more reddish; scutum and pleura with black hairs largely replaced by dull creamy yellow ones; legs paler, more like those of male; extensive scattering of dull yellowish cream hairs on abdominal tergites and sternites.

Male. Considerably paler than darker females. Eyes in life green, short scattered hairs visible at 15X magnification, not quite meeting in mid line, but showing narrow, deep frontal cleft, upper facets slightly enlarged and more or less clearly marked off from smaller, darker, lower and lateral ones, which do not extend above middle of eye at lateral margin. Ocellar tubercle elongate, only a little below level of eyes at vertex; group of creamy yellow hairs on postocular area, which is limited to narrow zone on either side of mid line. Frontal triangle, subcallus, parafacials, and face light yellowish fawn, parafacials bulging and with black or dull yellowish hairs, face somewhat sunken; beard creamy yellow. Antennae paler than in female; palpi about same colour as in female, but with more conspicuous black or yellowish hairs. Thorax brown with olive tint, and with relatively long, dense, dull yellowish cream to light brown hairs. Legs with brown femora, paler tibiae, darkening on distal tarsi, and with predominantly creamy yellow hairs giving place to black on the tarsi. Wings as in female, but basal and anterior veins light yellowish brown. Abdomen bright yellowish brown, darker olive brown on most of anterior half of 1st tergite, with median, olive-brown patch on tergite 2, trace of median darkening on tergites 3–4, and more diffuse darkening on apical segments; hairs light golden. In some specimens the central darkening on tergites tends to form a vague median vitta. Venter similar to dorsum, but without median darkening, and with better-defined apical pale fringes on sternites 2–4. Terminalia undistinguished.

Distribution. From Cape York SE in QLD to NE NSW. **QLD:** Cape York, 1868, Thorey; Port Denison, 1868, Thorey; Eungella Nat. Pk. 85 km W Mackay, Feb., F.E. French; Rockhampton; Port Curtis; Bundaberg, Feb., H. Frauca; 9.5 km SE Biggenden, Dec., H. Frauca; Gympie, Apr., R. Eastwood; nr Killarney, Jan., J. Bancroft, I.M. Mackerras, M.J. Mackerras; Dagg's Falls, nr Killarney, Jan., J. Bancroft, I.M. Mackerras. **NSW:** Acacia Ck, nr Legume, Jan., M.J. Mackerras; Lismore, Richmond R., Dec., Kilgin, Richmond R., Dec.; Eltham, Feb., C.E. Chadwick; Piper's Flat.

***Cydistomyia exemplum* Mackerras & Spratt, sp. nov.**

(Fig. 23)

Type material. Holotype female, S Qld, Mt Chinghee, 12 km SE Rathdowney, 700 m, Dec. 1982, G.B. Monteith, D.K. Yeates and G. Thompson (QM #T144397).

Diagnosis. A medium-sized, rather plain dark brown species distinguished from *C. obscurus*, *C. monteithi* and *C. sabulosus* by brown wings with brown suffusion in costal cell, brown scutum with broad median and more narrow lateral pale orange-brown vittae each containing rows of dark brown horizontal stripes giving a herring-bone appearance at 15–20X magnification, much narrower frons with narrow flask-shaped callus. Further distinguished from *C. obscurus* by thicker less elongate basal plate and absence of anterior prolongation on pedicel. Length 13 mm.

Female. Head. Eyes (relaxed) red-brown, bare. Frons convergent then divergent, very narrow, index 7.2, with dark brown tomentum and very few scattered short black hairs; vertex hollow, vertical triangle and ocellar tubercle not observed; with flask-shaped bulging brown callus about one half width of frons at base, with sharply tapering extension reaching middle half of frons. Subcallus brown, no hairs; parafacials and face with greyish brown tomentum and scattered short black hairs; beard sparse, mixed brown and black hairs. Antennal scape and pedicel greyish brown with black hairs, scape same width as length; flagellum light brown, basal plate with gently rounded dorsal angle. Palpi brown, with dense long black hairs.

Thorax. Scutum with broad median and more narrow lateral pale orange-brown vittae each containing rows of dark brown horizontal stripes giving a herring-bone appearance at 15–20X magnification, with few scattered white and black hairs around periphery. Scutellum uniform brown with scattered black hairs.

Legs. Legs brown, forelegs slightly darker than others and with black hairs, other legs with mixed black and white hairs.

Wings. Wings pale brown, brown suffusion in costal cell, stigma pale brown.

Abdomen. Paler brown than thorax, with narrow pale apical bands on tergites and mixed fine black and white hairs, with small patches of white hairs on lateral margins of tergites., Venter similar, with narrow pale apical bands with short white hairs on margins of sternites.

Distribution. Known only from type locality, in SE QLD near the border of NSW.

Etymology. The specific epithet derives from the Latin for pattern and refers to the herring-bone pattern on the thorax.

***Cydistomyia obscurus* Mackerras & Spratt, sp. nov.**

(Fig. 24)

Type material. Holotype female, Qld, Kauri Creek, Lamb Range, 1190 m, rainforest, Nov. 1998, C.J. Burwell (QM #T144372). Paratype male, same data as for holotype (QM).

Diagnosis. A medium sized 14–15 mm brown species with clear wings except for brown suffusion in costal cell and brown stigma in female. Distinguished from *C. exemplum*, *C. sabulosus* and *C. monteithi* by larger size, wider frons, oval shape of callus with short narrow extension and elongate antennal flagellum. Further distinguished from *C. exemplum* by absence of herringbone pattern on thorax at 15–20X magnification.

Female. Head. Eyes (relaxed) red-brown, bare. Frons slightly divergent, wide, index 3.7, tomentum dark reddish brown, no hairs visible; vertex hollow, vertical triangle and ocellar tubercle not observed. Callus shiny dark brown, raised, not full width of frons at base, with narrow extension reaching to middle of frons. Subcallus dark reddish grey, no hairs; face similar; parafacials black (possibly due to killing in amyl acetate), with very short black hairs; beard white. Scape and pedicel brown with long black hairs; basal plate narrow, brownish orange, with small dorsal tooth with short black hairs, contrasting with black style. Palpi plump, pale brown, with black hairs, especially long basally.

Thorax. Scutum and scutellum dark brown, with appressed short white hairs, longer on posterior margin of scutum, absent from margin of scutellum.

Legs. Legs brown, femora with mixed black and white hairs, remainder of legs with black hairs.

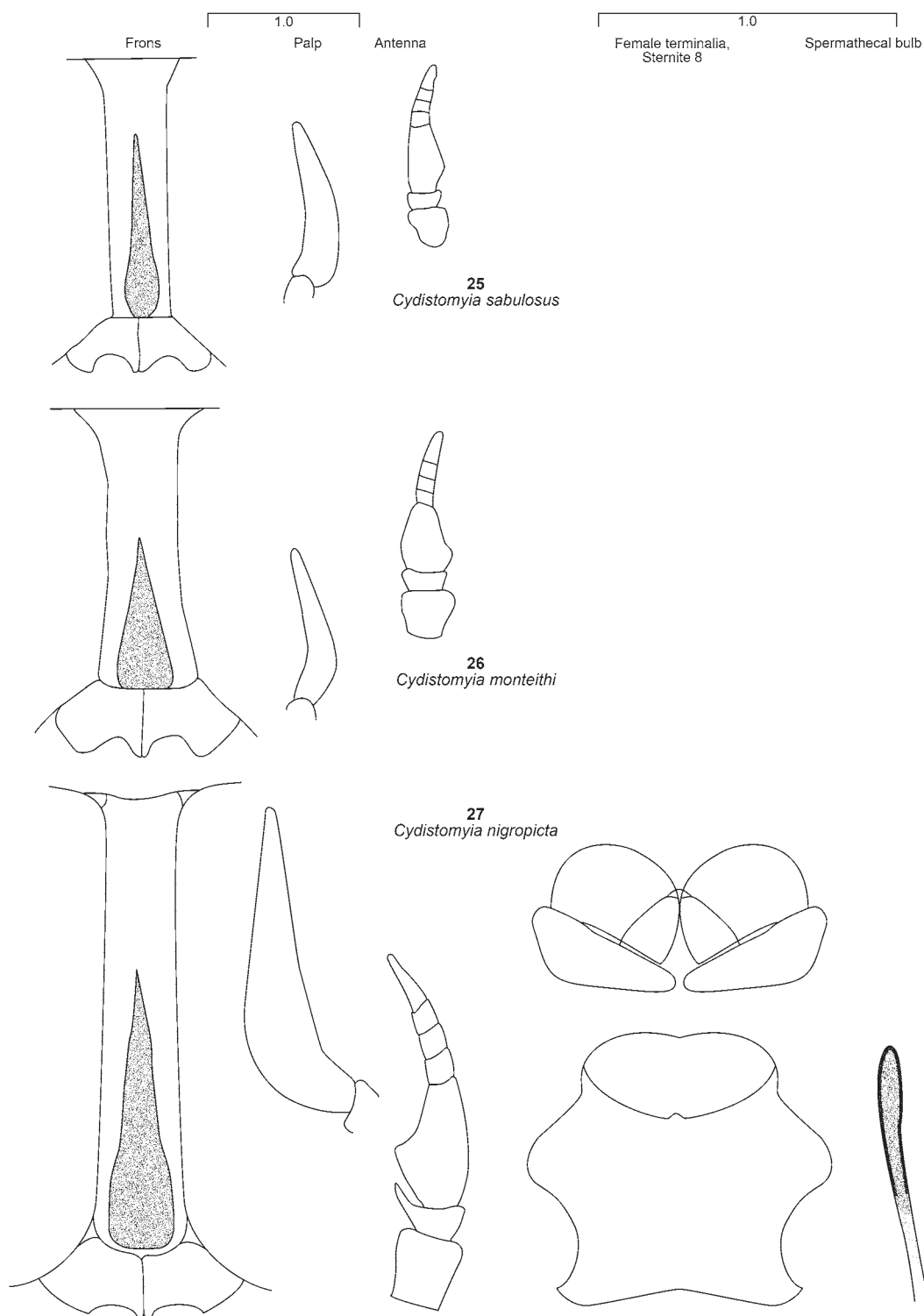
Wings. Clear except for brown suffusion in costal cell and brown stigma.

Abdomen. Abdomen with narrow pale bands with fine white hairs on apical margins of tergites, fine black hairs elsewhere, tergite 7 with long black hairs. Venter similar.

Male. Similar but paler, abdomen with longer brownish orange hairs over all tergites and on posterior margins of scutum and scutellum. Venter with longer white hairs over all sternites. Eyes bare, upper facets enlarged. Ocellar tubercle not visible. Subcallus greyish brown; parafacials and face grey with mixed black and white hairs. Palpi cream, with long black hairs, second segment plump tapering to gently rounded tip. Wings light brown, costal and subcostal cells suffused with brown, stigma brown.

Distribution. Known only from type locality SW of Gordonvale and E of Atherton, N QLD.

Etymology. The specific epithet derives from the Latin for undistinguished and refers to the generally plain appearance of the species.



FIGURES 25–27. 25. *Cydistomyia sabulosus* Mackerras & Spratt, **sp. nov.** frons, palp, antenna. 26. *Cydistomyia monteithi* Mackerras & Spratt, **sp. nov.** frons, palp, antenna. 27. *Cydistomyia nigropicta* (Macquart) frons, palp, antenna, female terminalia, sternite 8, spermathecal bulb.

Cydistomyia sabulosus* Mackerras & Spratt, **sp. nov.*
(Fig. 25)

Type material. Holotype female, Qld, Great Sandy Nat. Pk., Fraser Is., Oct. 1996, D.K. Yeates, C.L. Lambkin & S. Winterton (QM T#144399). Paratype male, same data as holotype (QM)

Diagnosis. A small plain brown species to be distinguished from *C. exemplum* by clear rather than pale brown wings except for brown suffusion in costal and subcostal cells, absence of herringbone appearance of scutum at 15–20X magnification and narrow tear-drop shaped callus with anterior extension reaching to three quarters length of frons. Distinguished from *C. obscurus* by latter feature noted above, narrower frons, less elongate antennal flagellum and absence of anterior prolongation on pedicel. Length 12–13 mm.

Female. Head. Eyes (relaxed) green, bare. Frons parallel, index 4.5, tomentum dark brown, no hairs; vertex flat, vertical triangle and ocellar tubercle not observed; callus dark brown, shiny raised slightly, about one half width of frons at base, with tapering extension reaching to three-quarters length of frons. Subcallus greyish brown, no hairs; parafacials and face greyish brown, with short black hairs; beard predominantly black with some white hairs. Antennal scape and pedicel pale brown, with black hairs; scape as wide as long; flagellum pale orange brown, basal plate narrow, flat ventrally with minute gently rounded dorsal angle. Palpi grey with black hairs.

Thorax. Scutum brown with faint broad median and narrower lateral dark brown vittae without darker herring bone pattern, with fine mixed black and white hairs. Scutellum brown; posterior margin of scutum and particularly scutellum with long greyish white hairs.

Legs. Uniformly brown with black hairs.

Wings. Clear except brown suffusion in costal and subcostal cells and stigma pale brown.

Abdomen. Brown with narrow pale apical bands bearing some fine white hairs on tergites, otherwise hairs short, black; with patches of white hairs laterally on tergites. Venter similar, with more mixed white and black hairs.

Male. Similar to female but with very long white hairs on scutum and scutellum, most pronounced on posterior margins and much longer black hairs on femora. Eyes bare, upper facets enlarged; ocellar tubercle not visible. Palpi cream, plump, tapering to rounded tip, with long mixed white and black hairs.

Distribution. Known only from type locality on Fraser Is., off the coast from Maryborough, QLD.

Etymology. The specific epithet derives from the Latin for sandy referring to the locale of the species.

***Cydistomyia monteithi* Mackerras & Spratt, sp. nov.**
(Fig. 26)

Type material. Holotype female, NSW, Mt Keira nr Wollongong, Feb., G.B. Monteith (QM T#144400).

Non-type material examined. NSW: 2♀ Mt Keira nr Wollongong, 15.i.1949, D.A. Walsh (ANIC).

Diagnosis. A small plain dark brown species to be distinguished from *C. sabulosus* by uniformly grey-brown wings without brown suffusion in any cells, along wing veins nor on stigma, and triangular callus with extension reaching only to middle of frons. Length 12mm.

Female. Head. Eyes (relaxed) red-brown, bare. Frons slightly divergent, narrow, index 4.1, with dark brown tomentum, with appressed long pale brown hairs; vertex flat, vertical triangle and ocellar tubercle not observed; callus brown, bulging, triangular, about one half width of frons at base, with extension reaching to middle of frons. Subcallus greyish brown, no hairs; parafacials and face greyish brown, with long black hairs; beard mixed black and white hairs. Antennae uniform greyish brown, scape one and a half times as long as wide, with long black hairs especially ventrally; pedicel wider than long with short black hairs; basal plate with small gently rounded dorsal angle and small ventral bump. Palpi narrow, greyish brown, with dense relatively long black hairs.

Thorax. Dark brown with short orange-brown hairs, Similarly on scutellum but longer, especially on posterior margin

Legs. Legs uniform brown with short black hairs on forelegs, mixed short black and long white hairs on other legs.

Wings. Uniformly greyish brown, without brown suffusion in cells, along vein margins or on stigma.

Abdomen. Dark brown with black hairs, with pale bands with relatively long white hairs on apical margins of tergites, slightly more pronounced on lateral margins of tergites. Venter similar, with white hairs on apical bands of sternites slightly more conspicuous..

Distribution. Known only from type locality near Wollongong, NSW.

Etymology. The specific epithet is in honour of Dr. Geoff Monteith and his tireless collecting efforts in support of entomology in Australia.

***Cydistomyia nigropicta* (Macquart)**

(Figs. 3, 27)

**Tabanus nigropictus* Macquart, 1855: 44; Froggatt 1911: 8, 15, 1915: 8, 16; Hardy 1939: 42 (erroneously as syn. *palmensis* Ferguson & Hill), 1944: 84 (*nigropictus* Froggatt, 1915, nec Macquart, as syn. of *sanguinarius* Bigot); Chainey 1990 (types). Type female, 'de l'Inde' (error; cf. Daniels 1989: 287) (BMNH).

Cydistomyia nigropicta; Mackerras 1959: 166; Daniels 1989: 287; Bickel & Elliot, 1998-2005: 4.

**Atylotus sanguinarius* Bigot, 1892: 675; Froggatt 1911: 6, 16, 1915: 7, 17; Ricardo 1915a: 287 (?syn. of *nigropictus* Macq.), 1917: 221; Taylor 1918: 65, 1919: 64; Ferguson 1916a: 206, 1920: 132, 1921a: 373; Ferguson & Henry 1920: 844; Surcouf 1921: 83; Hardy 1939: 42 (misspelt *sanguineus*), 1944: 84. (All as *Tabanus*). Mackerras 1959: 166, (syn. of *nigropictus* Macq.); Chainey 1990: 305 (4 syntypes, females) Australia (BMNH).

Other material examined. 267 ♀, 11 ♂.

Diagnosis. A large, bright, slightly reddish brown species, with bright orange antennae, yellowish brown legs, and wings tinged with yellowish brown. To be distinguished from *C. hyperythrea* by conspicuous dark callus on narrower frons, longer antennae with longer antennal style, pronounced sub-basal dorsal angle and small apical ventral swelling on basal plate, and less dense black hairs on palpi. To be distinguished from *C. avida* by larger size, somewhat darker colouration, fainter markings on wings, and abovementioned features of basal plate. Length 17–20 mm.

Female. Head. Eyes in life green, bare, (fine sparse hairs just visible at 35X magnification). Frons parallel, index 5.1–6.6, with yellowish fawn tomentum along eyes, more brownish in centre, with short ocellar tubercle barely perceptible; callus shiny, brown, about three-quarters width of frons at base, oblong, with extension to a little beyond middle of frons. Subcallus creamy, with inconspicuous brown hairs; parafacials and face creamy to yellowish cream, with short cream hairs; beard yellowish cream. Antennal scape and pedicel brown, with some greyish overlay, hairs mainly black; flagellum bright orange-brown, little if any darker towards tip of style, basal plate with prominent sub-basal dorsal angle and gentle ventral swelling towards apex. Palpi yellowish fawn, with yellowish cream hairs and some short black ones.

Thorax. Scutum and scutellum brown with fawn tint, especially anteriorly and laterally, with short erect black and appressed creamy hairs. Pleura grey to light fawn, with cream to white hairs.

Legs. Bright yellowish brown, femora and tarsi a little darker; hairs mainly brown to golden brown.

Wings. Greyish, costal cell yellowish brown; faint yellowish brown suffusion along radial veins and those bordering basal cells.

Abdomen. Bright brown, often with slight yellowish hue, darkening somewhat towards tip, with indications of paler apical margins on tergites 2–4; hairs on disc black, inconspicuous creamy yellow median patches on apical margins, cream to yellowish cream along lateral margins. Venter brown, with black hairs, apices of sternites with narrow cream band bearing creamy white hairs.

Male. Similar to female but more hairy, slightly smaller, with paler brown abdomen and legs, particularly tarsi which are not darkened. Eyes bare, meeting over most of length of frons, swollen, upper facets enlarged, reddish brown, contrasting with darker small lower and posterior ones. Ocellar tubercle not observed. Palpi sub-cylindrical, tapering, bluntly rounded distally, greyish brown, hairs predominantly black with a few

creamy white ones.

Distribution. From central QLD through SE coastal areas, NE NSW and S to the Sydney region. **QLD:** Captain's Ck via Miriam Vale, Oct., A.L. Dyce; Kroombit Tops, 45 km SSW Calliope; Bundaberg, May, R.J. Tomlins; Fraser Is., Jan., M. Dick and P. Hunt, H.A. Standfast, Feb., biting, M.J. Mackerras, Mar., A.L. Dyce; Eurong Beach, Fraser Is., Dec., I.F.B. Common; Lake Boeminger Fraser Is., Nov., A. Slater and G. Thompson; near Coalstoun Lakes, SW of Biggenden, Dec., H. Frauca; Tin Can Bay, Jan., H.A. Standfast; Cooloola, Mar., E. Dahms, S. Johnston, Aug., A. Wright; Cooloola State Forest via Gympie, Dec., R.I. Storey; Cooloola Nat Pk, Apr.; Noosa Heads, biting, Feb., D.M. Spratt, Mar., H.A. Standfast; Noosa Nat. Pk., Nov., Mar., E.N. Marks, biting; Brown's Ck, Eumundi; Nambour, Mar., H.A. Standfast; Kilcoy, Dec., Jan., H. Hacker; Woombye, Dec., D.H. Colless; Buderim Mt, biting, Dec., E.N. Marks, Apr., H. Hacker; Mooloolabah, Apr., E.N. Marks; Montville, C. Deane; Caloundra, Jan., H. Hacker; Conondale Nat. Pk., Feb., J. and A. Skevington; Woodford, Nov.; Camp Mt 20 km NW Brisbane, Dec.; Mt Glorious, Jan., I.M. Mackerras, Feb., D.M. Spratt; Upper Cedar Ck, Jan., I.M. Mackerras; Samford, Nov., R. Domrow, Mar., H. Hacker; Highvale, 22 km W of Brisbane, Dec., R. Strautman; Mt Nebo, Dec., E.H. Derrick, Feb., P. Haycock; Brisbane, Nov., T. Brooks, Mar., H. Hacker; Indooroopilly, Dec. D.S. Kettle; Scrub Creek Road Brisbane Forest Park, Jan., C.L. and J.D. Lambkin; North Stradbroke Is., Jan., S.G. Wright; Stradbroke Is., Nov., J. O'Hagan, Dec.–Jan., H. Hacker, J. and A. Skevington and D. Reeves, Mar., D.M. Spratt; Mt Cotton, Dec., C.J. Burwell; Greenbank, Nov., H.A. Standfast; Kholo, nr Ipswich, Dec., M. Colbo; Mt Tamborine, L. Pottinger, Dec., H. Hacker, Mar., biting, I.M. and M.J. Mackerras, May, J.W. Davidson; Nerang, Oct.; Canungra, Feb., J. Wylie, H.A. Standfast; Canungra Ck, Jan., G.B. Monteith; "Glen Witheren" nr Canungra, Dec., Jan., G.B. Monteith; Upper Coomera R., nr Canungra, biting, I.M. and M.J. Mackerras; 5 km S Canungra, Jan., Feb., G.B. Monteith; Binna Burra, biting, Dec., I.M. and M.J. Mackerras, Feb., J.T. Brooks, M.J. Mackerras; Mt. Tamborine; Springbrook, biting, Feb., E.N. Marks; Nerang R., nr Springbrook, Dec., T.G. Campbell; Lamington Nat. Pk., Jan., H.J. Carter, O.W. Tiegs, Feb., F.A. Perkins; Tallebudgera Valley, Dec., Jan., D. Cook, G.B. Monteith and G. Thompson; Yalla, Jan. **NSW:** Acacia Plateau, Dec., J.W. Davidson; Tooloom Scrub, nr Urbenville, Dec., I.M. and M.J. Mackerras, Jan., H. Hacker; Brunswick Heads, Feb., D.E. Havenstein; Bangalow, Nov., Marr; 11 km W of Rosebank, 518 m, Nov., I.F.B. Common and M.S. Upton; Eltham, Dec., C.E. Chadwick; Richmond R., W.W. Froggatt; Lismore, in cowbails, Tregeagle, Dec., D.K. Yeates, Mar., W.W. Froggatt; Bald Rock Nat. Pk., Dec., D.K. Yeates; 2 km NE by E. of Rous Hill, Nov., I.F.B. Common and E.P. Edwards; Washpool Nat. Pk., Jan., J. and A. Skevington; Summit Mtn, Gibraltar Ra Nat. Pk., Dec., D.K. Yeates and C. Palmer; Clarence R.; Grafton; Feb., A.J. Nicholson; 14 km SE of Grafton, Dec., P. Carne, E. Britton; 32 km S of Grafton, Nov., E.J. Reye; Styx R., Dec., E.F. Riek; Glenreagh, Jan.–Feb.; Bark Hut, 14 km W of Woolgoolga, Feb., T.G. Campbell; Dorrig Nat. Pk. via Dorrig, Jan., T. Weir; 11 km SE of Dorrig, Feb., L. Chinnick and Lewis; Dorrig Scrub, Jan., J. Bancroft and I.M. Mackerras; Dorrig, Jan., B.K. Cantrell; Meldrum, Mar., New England Nat. Pk. via Ebor, Jan., T. Weir; Raven; 3 km W of Bonville, Jan., N. Roffey and Mitchell; Boambee, Jan., K.R. Norris; 8 km W of Boambee, Mar., K.L. Taylor; Point Lookout, nr Ebor, Dec., I.M. and M.J. Mackerras; N of Middle Head, nr Macksville, Nov.; T.G. Campbell; Port Macquarie, Jan., M.F. Day; Wauchope, Goodacre; Hastings R., Nov., E.J. Reye; Kew, Jan.; Kendall, Jan.–Mar.; Kundibakh, C. Dennes; Myall Lakes, Nov., Le Soeuf; Eccleston, Mar., J. Hopson; Kurrajong, Feb.; Leura; Asquith, pupa which emerges in Nov., A.L. Dyce; Epping, larva which emerges in Nov., Oct., F.H. Taylor; Illawarra.

Cydistomyia hyperythrea (Bigot)

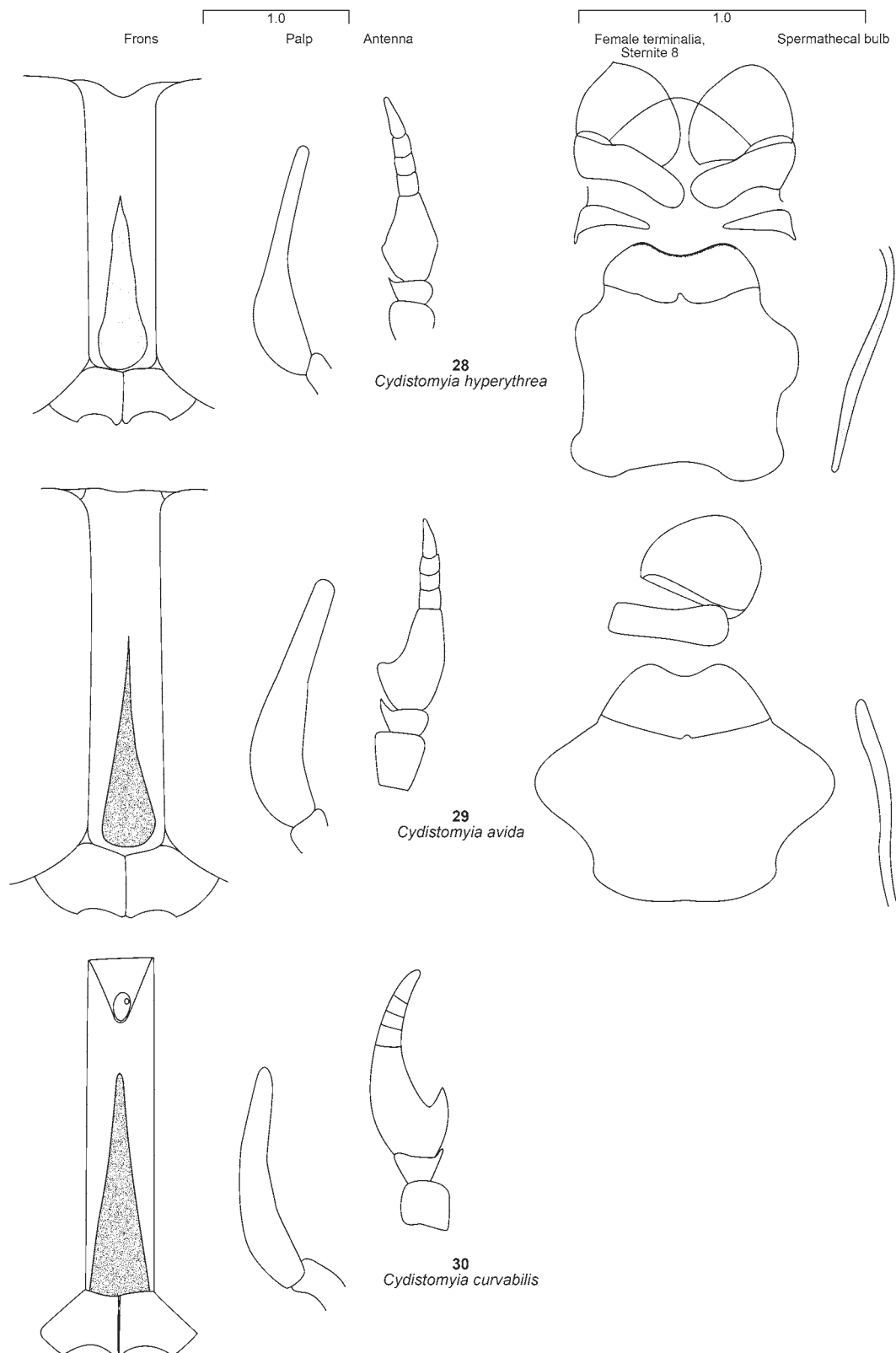
(Fig. 28)

**Atylotus hyperythreus* Bigot, 1892: 674; Chainey 1990: 274. Holotype female, Australia (BMNH).

Tabanus hyperythreus; Froggatt 1911: 14, 1915: 15; Ricardo 1915a: 286; Surcouf 1921: 71.

Cydistomyia hyperythrea; Mackerras 1959: 167; Daniels 1989: 287; Bickel & Elliot, 1998-2005: 3.

Tabanus lorentzi; Ricardo, 1915a: 286, nec Ricardo, 1913: 400 (misidentified, New Guinea).
Other material examined. 10 ♀, 1 ♂.



FIGURES 28–30. 28. *Cydistomyia hyperythrea* (Bigot) frons, palp, antenna, female terminalia, sternite 8, spermathecal bulb. 29. *Cydistomyia avida* (Bigot) frons, palp, antenna, female terminalia, sternite 8, spermathecal bulb. 30. *Cydistomyia curvabilis* Mackerras & Spratt, **sp. nov.** frons, palp, antenna.

Diagnosis. A medium-sized, parallel-sided, reddish brown species, with fairly well-defined contrast between darker dorsum and pale greyish pleura and venter, orange-brown antennae, pale creamy fawn palpi; wings suffused with greyish brown, and light yellowish brown legs. Distinguished from *C. nigropicta* and *C. avida* by paler callus blending into wider frons, more dense covering of black hairs on palps, short basal plate with gentle median dorsal and ventral angles. Length 12–16 mm.

Female. Head. Eyes in life green (relaxed) blackish, bare, (fine sparse hairs just visible at 35X magnification). Frons parallel, index 3.8–4.4, with bright brown tomentum, short dark brown hairs; ocellar tubercle not visible; callus pale reddish brown, about two-thirds width of frons at base, with tapered extension to just above middle of frons. Subcallus yellowish fawn, with occasional inconstant dark hairs on upper part; parafacials pale creamy fawn, with brown hairs; face a little paler, almost entirely bare; beard brown, with some greyish white hairs below. Antennal scape and pedicel light greyish fawn to yellow, with brownish black hairs; flagellum bright orange-brown, style darker at extreme tip, basal plate short with gentle median dorsal and ventral angles. Palpi pale creamy fawn with brownish black hairs, a few pale ones below.

Thorax. Scutum and scutellum bright reddish to a yellowish brown, with faint indications of dorsocentral lines, with erect dark brown hairs and appressed dull golden ones. Pleura pale grey with fawnish tints, hairs greyish white mixed with a few dark ones on mesopleural area.

Legs. Light yellowish brown; hairs mixed dark brown and greyish white on fore and mid femora, almost entirely creamy white on hind femora, bright brown on other segments except for some black ones on postero-lateral aspect of hind tibiae.

Wings. Lightly and evenly suffused with greyish brown, costal cell dark brown; stigma bright brown, moderately conspicuous; veins brownish yellow.

Abdomen. Bright reddish brown, sometimes with yellowish hue, with apices of tergites only faintly, if at all, paler; hairs on disc mixed dark brown and deep golden, mainly dark brown on lateral margins, with some blackish hairs at margins of 3rd and 4th tergites and some greyish white ones on 5th tergite. Venter light greyish brown, with some overlying pale grey tomentum; hairs black in central part of sternites, greyish white laterally and conspicuously creamy white on paler apical edges.

Male. Similar to female but more hairy. Eyes bare, with upper facets markedly enlarged, yellowish brown, contrasting with dark brown small lower and posterior ones. Ocellar tubercle sunken below level of eyes, ocelli not observed. Palpi yellowish fawn, second segment with brown and some white hairs. Scutum with long dull golden hairs, contrasting with silky white pleural hairs.

Distribution. NE NSW from Dorrigo to the Sydney region. NSW: Dorrigo, Jan., Wright; Myall Lakes, Nov., Le Souef; Grose R., Jan., Henry; Woodford, Jan., I.M. Mackerras; 64 km N of Sydney, Dec., Riek; Galston, Dec., Willings; Kundibakh, C. Dennes; Asquith, Dec., A.L. Dyce; Sydney, Jan., Urquhart; Nat. Pk., Jan., I.M. Mackerras; Bundeena, Dec., Nikitin.

Cydistomyia avida (Bigot)

(Fig. 29)

**Atylotus avidus* Bigot, 1892: 673. Froggatt 1911: 13, 1915: 14; Ricardo 1915a: 286 (?syn. of *posticus* Wied.); Ferguson 1921a: 373; Surcouf 1921: 61 (?syn. of *posticus* Wied.); Hardy 1939: 42, 1944: 84, (syn. of *posticus* Wied.); Chainey 1990: 248. 2 female syntypes, Australia, in BMNH.

Cydistomyia avida; Mackerras 1959: 166; Daniels 1989: 286; Bickel & Elliot, 1998-2005: 3.

**Tabanus fuscipes* Taylor, 1913: 62 [Preoccupied by Ricardo, 1908: 332], Ethiopian; Ricardo 1915a: 286 (syn. of *avidus* Bigot); Froggatt 1915: 17; Surcouf, 1921: 61 (syn. of *avidus* Bigot) (misspelt *fucipes*) Taylor nec Ricardo; Ricardo 1915a: 286 (syn. of *avidus* Bigot); Ferguson 1916a: 206; Surcouf, 1921: 61 (syn. of *avidus* Bigot). Type female and paratype male, from Magnetic Island, north Qld. (ANIC).

Tabanus taylori Austen, 1914: 265 (replacement name for *fuscipes*).

Tabanus posticus Hardy, 1944: 84, nec Wiedemann, 1828: 152 (= *Dasybasis*); Surcouf 1921: 61 (? syn. of *avidus* Bigot);

Hardy 1948: 177(as subgen. *Cydistomyia*); Mackerras 1959: 166 (corrected misidentification, confirmed synonymy).

Other material examined. 301 ♀, 7 ♂.

Diagnosis. A medium-sized, yellow and brown species, with greyish fawn scutum, yellowish brown abdomen, generally yellowish basally and darkening to brown apically but occasionally predominantly yellowish, yellowish to light brown antennae, yellowish palpi, light brown legs, and with the wings more or less extensively suffused with yellowish brown along all veins giving them a characteristic appearance. To be distinguished from *C. nigropicta* as stated under that species and from *C. hyperythrea* by its conspicuous shiny black callus on narrower frons, less dense hairs on palpi, sharp right-angled dorsal angle (sometimes bearing short forwardly directed tooth) and smoothly rounded ventral surface on basal plate. Length 13–16 mm.

Female. Head. Eyes (relaxed) reddish brown or green, bare. Frons parallel or slightly divergent, index 4.8–5.5, with brown to fawn tomentum and brown hairs; ocellar tubercle indicated, ocelli not observed; callus dark brown, somewhat narrower than frons at base, pyriform, with tapering extension to a little above middle of frons. Subcallus yellowish fawn, without hairs; parafacials and face pale creamy fawn, with yellowish cream hairs and a few brown ones; beard cream to yellowish cream. Antennal scape and pedicel light brownish yellow, with black hairs, a few cream ones on scape; flagellum light yellowish to bright brown, sometimes darkening a little on style; basal plate with conspicuous right-angled dorsal angle, sometimes bearing short forwardly directed tooth and smoothly rounded ventral surface. Palpi light to dull yellow, with creamy yellow hairs and some darker brown ones more apically.

Thorax. Scutum and scutellum almost uniformly greyish fawn, with inconspicuous black hairs and more evident dull yellowish cream appressed ones. Pleura light greyish fawn, with creamy hairs.

Legs. Bright brown, anterior surface of fore femora, tibiae and all tarsi darker.

Wings. Greyish, costal cell yellowish brown; yellowish brown to brown suffusion along all veins.

Abdomen. More or less uniformly yellowish brown, often darkening apically, with only slight indications of paler apical edges to tergites, hairs black, insignificant median apical yellowish patches and creamy yellow hairs at lateral margins. Venter brown, with creamy apical edges to sternites, predominantly cream hairs on discs as well as apical edges.

Male. Similar to female, one specimen darker, others lighter in colour. Eyes bare, (few short hairs just visible at 35X magnification), blackish, upper facets enlarged, not contrasting in colour with small lower and posterior ones. Ocellar tubercle present, not sunken, ocelli not observed. Palpi subcylindrical, tapering, bluntly rounded distally, greyish fawn, with sparse fine hairs mixed black and creamy white.

Distribution. Coastal NE to SE QLD. **QLD:** Cape York; Cape Tribulation, Dec., Jan., G.B. Monteith; Crystal Cascades via Cairns, Nov., G.B. Monteith; Tully, Oct; Mission Beach, Sept., G. Ettershank; Meunga Ck, Cardwell, Oct.; Hinchinbrook Is., Dec.-Jan., D.M. Spratt; Palm Is., G.F. Hill, Bancroft, Nov., A. Breinl, Dec.-Jan., I.M. and M.J. Mackerras; Little Crystal Ck, Mt Spec, Nov., E.N. Marks, Dec., M.J. Mackerras; Magnetic Is., J.W. Fielding, F.H. Taylor, Nov-Dec., G.F. Hill; West Point, Magnetic Is., Feb., P. Ferrar; Horse-shoe Bay, biting, Dec., Townsville, A. Breinl, G.F. Hill, F.H. Taylor, Hervey's Ra., J.W. Fielding; Ching Do, F.H. Taylor; Townsville, F.H. Taylor; Mt Cleveland Summit 25 km E of Townsville, Jan., A. Graham; Hayman Is., Oct. Dobson; Whitsunday Is., Jan., N. Geary; Scawfell Is., Nov., G.N. Batianoff; Mackay, Feb.; Marwood, nr Mackay, Jan., W.G. Harvey; Sarina, Jan.-Feb.; 37 km S of Sarina, biting, Dec.; Clairview Beach 22 02, Nov., D.S. Kettle, biting; Byfield, Nov., Wilkinson, Dec., I.F.B. Common; Yeppoon, Nov., G.M. Goldfinch, Dec., I.F.B. Common, H.E. Evans, Jan., I.F.B. Common; Rockhampton; Rosslyn Head Section Coast Nat. Pk., Nov., G.M. Goldfinch, Dec., C.L. Lambkin; Westwood; Happy Valley, Fraser Is., May., E.N. Marks; Lake McKenzie Fraser Is., E.N. Marks; Cooloola, W.B. Wilson; Nambour, Sept., Kirkpatrick; Montville, C. Deane; Point Lookout Stradbroke Is., Mar., G. Daniels and C.J. Burwell; 3.5 km WSW of Point Lookout Stradbroke Is., Mar., G. Daniels and C.J. Burwell; Dunwich, Mar., F.A. Perkins; 7 and 6 km E of Dunwich, North Stradbroke Is., Mar., Apr., G. Daniels and C.J. Burwell; 13 km NE of Dunwich, Feb., G. Daniels and C.J. Bur-

well; Brown Lake, Stradbroke Is., Feb., Apr., G. Daniels, Mar., D.K. Yeates, M.A. Schneider; 18 Mile Swamp, Stradbroke Is., Mar.; 18 Mile Beach, North Stradbroke Is., Apr., D.K. Yeates; Broke Is., North Stradbroke Is., Mar., H.E. and M.A. Evans and A. Hook; Brisbane, Feb., H. Hacker, May, Muir; Springbrook, Nov., D.S. Kettle.

***Cydistomyia curvabilis* Mackerras & Spratt, sp. nov.**

(Fig. 30)

Type material. Holotype female, NT, Koongarra, 15 km E of Mt Cahill, 27.xi.1974, T. Weir & T. Angeles (ANIC).

Paratype male, same data as for holotype (ANIC).

Diagnosis. A medium-sized species with grey scutum, dark brown to blackish banded abdomen, narrow frons with pyriform callus tapering uniformly to fine point at two-thirds length of frons, broad brown basal plate on antennal flagellum with recurved dorsal angle bearing short forwardly directed tooth. To be distinguished from *C. duplonotata* and *C. improcerus* by these antennal features, dark banded abdomen, absence of abdominal vitta, shape of callus which is almost full width of frons at base and generally smaller size. Length 12–13 mm.

Female. Head. Eyes (relaxed) dark brown, bare. Frons parallel, index 4.8, with dull fawn tomentum and short dark brown hairs; ocellar tubercle brown, bare; callus brown, moderately shiny, almost full width of frons at base, with uniformly tapering extension which reaches two-thirds length of frons. Subcallus fawn, without hairs; parafacials yellowish fawn, face more greyish, both with creamy white hairs mixed with a few darker ones; beard creamy white. Antennal scape and pedicel dark fawn with black hairs, pedicel with dorsal prolongation, antennal flagellum brown, robust, with recurved dorsal angle produced into short forwardly directed tooth similar but not as long as that in *alternata*, style darker brown. Palpi fawn, with a few short white and numerous short black hairs.

Thorax. Scutum and scutellum grey, paler and with olive tint anteriorly, with erect black and appressed yellowish brown hairs, marginal hairs black. Pleura grey, with dull whitish grey hairs.

Legs. Femora black, with short black hairs; tibiae brown with black hairs; tarsi dark brown, with short black hairs.

Wings. Lightly greyish brown; veins brown; stigma brown.

Abdomen. Blackish brown, with narrow pale apical band on all tergites, widening laterally, hairs short, black, with longer creamy white ones over pale apical areas. Venter similar, with short black hairs and longer creamy white ones over pale apical bands on each sternite.

Male. Similar to female but more hairy, with brown rather than blackish abdomen. Eyes bare (few short hairs just visible at 35X magnification), meeting over most of length of frons, upper facets reddish brown, enlarged, marked off by fairly definite line from small slightly darker lower and posterior ones. Ocellar tubercle sunken below level of eyes, ocelli not observed. Palpi subcylindrical, tapering, bluntly rounded distally, yellowish cream, hairs mixed black and greyish white.

Etymology. The specific epithet refers to the recurved dorsal angle on the basal plate of the antennal flagellum.

Distribution. Known only from type locality S of Jabiru, in Kakadu National Park, NT.

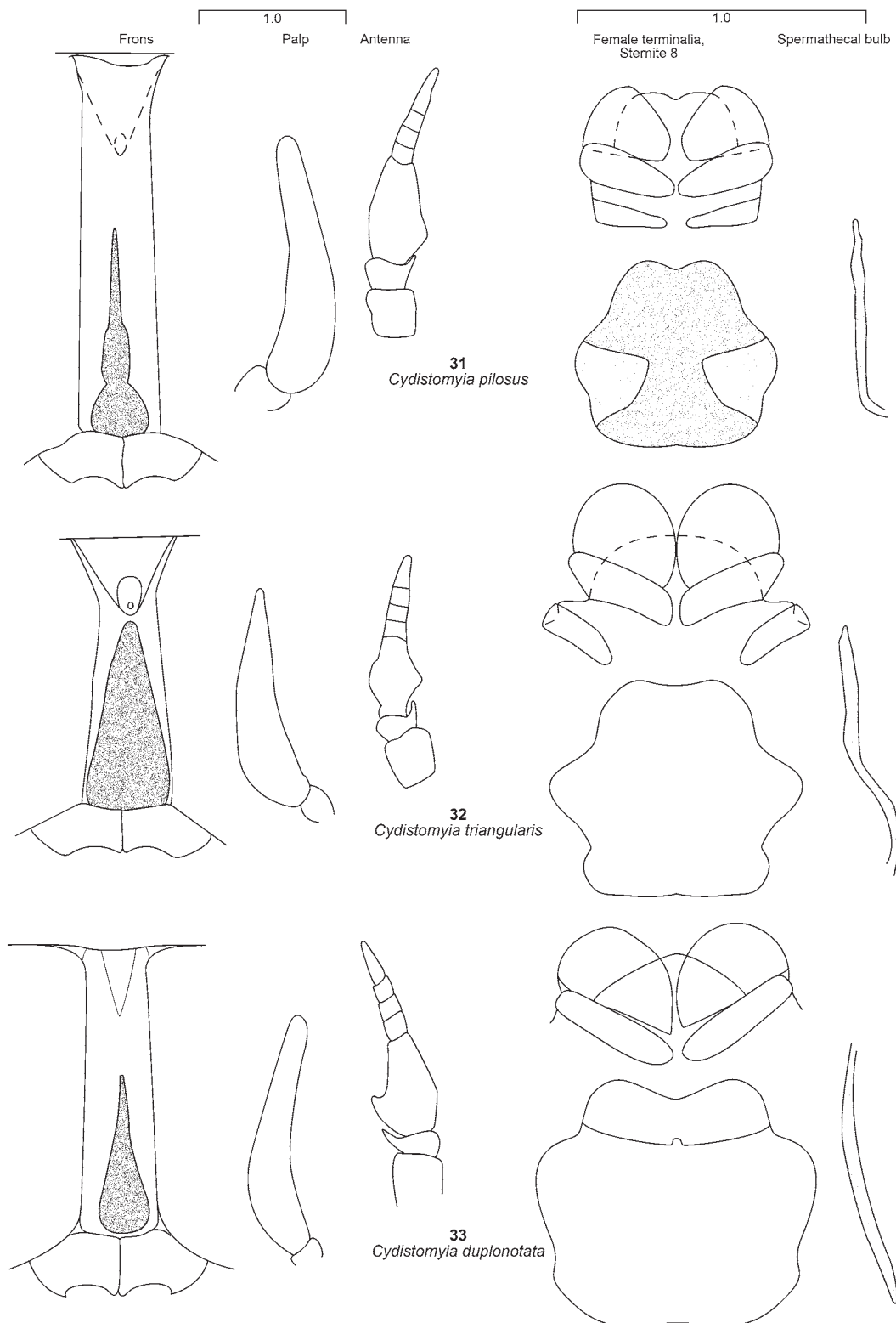
***Cydistomyia pilosus* Mackerras & Spratt, sp. nov.**

(Fig. 31)

Type material. Holotype female, Qld, Maroochy Horticulture Research Station, Nambour, Mar., 1985, (QM #T144401).

Paratype females (2), same locality as holotype, Mar., Apr., (QDPI).

Non-type material examined. **QLD:** 1♀ Mt. Glorious, 16.i.1972, G.B. & S.R. Monteith (UQIC), 1♀ 24.ii.1972, Gress (ANIC). **NSW:** 1♂ Wardell Cemetery, 16.x.1998, D.K. Yeates (UQIC); 1♂ Mooney Mooney Creek nr Gosford, 16.xii.1975, G. Daniels (GDCB).



FIGURES 31–33. 31. *Cydistomyia pilosus* Mackerras & Spratt, **sp. nov.** frons, palp, antenna, female terminalia, sternite 8, spermathecal bulb. 32. *Cydistomyia triangularis* Mackerras & Spratt, **sp. nov.** frons, palp, antenna, female terminalia, sternite 8, spermathecal bulb. 33. *Cydistomyia duplonotata* (Ricardo) frons, palp, antenna, female terminalia, sternite 8, spermathecal bulb.

Diagnosis. A robust 14–15 mm dark brown to black species with most of body except eyes covered in dense black hairs, unlike any other species described herein and superficially resembling *C. crepuscularis* Oldroyd of New Guinea.

Female. Head. Eyes (relaxed) dark red brown, bare. Frons parallel, narrow, index 5.2, tomentum grey brown with scattered short black hairs; vertex hollow, vertical triangle grey with black hairs; ocellar tubercle indistinct, brown, anterior ocellus occasionally present; callus bulging brown, pyriform, not full width of frons at base, with uniformly tapered extension reaching to upper third of frons. Subcallus with pale brown tomentum, no hairs; parafacials and face pale brown, with long black hairs; beard black. Antennal scape and pedicel greyish brown, with black hairs, pedicel with slight dorsal anterior prolongation; flagellum pale orange; basal plate relatively narrow, with small dorsal tooth. Palpi pale brown, with long black hairs.

Thorax. Scutum and scutellum greyish brown, with fine black hairs; scutum with broad median and narrow lateral black vittae. Pleura grey, with long black hairs.

Legs. Legs dark brown, with dense black hairs.

Wings. Wings uniform light brown, costal cell suffused with brown, stigma brown.

Abdomen. Dark brown to black, with black hairs, first and second tergites more brown than black. Patches of white hairs on lateral apical margins of tergites 1–4. Venter dark brown to black, with black hairs.

Male. Similar to females but abdomen more brown than black both dorsally and ventrally. Body with more and longer black hairs. Eyes bare, upper facets enlarged. Ocellar tubercle not visible. Palpi fawn, with long black hairs, second segment plump, tapering almost uniformly to fine round tip.

Distribution. From SE coastal QLD S to near Gosford NSW.

Etymology. The specific epithet derives from the Latin for hairy and refers to the dense black hairs covering the body with the exception of the eyes.

Cydistomyia triangularis Mackerras & Spratt, sp. nov.

(Fig. 32)

Type material. Holotype female, Qld, nr Teewah Creek, Cooloola National Park., Apr., J. & A. Skevington (QM #T144396). Paratype females (6), same data as for holotype (QM).

Diagnosis. A medium sized 10–12 mm dark brown species with black median abdominal vitta, to be distinguished from *C. duplonotata* and *C. improcerus* by generally smaller size, absence of narrower median vitta or triangles of pale hairs on black median vitta, and large shiny dark brown, bulging callus shaped like an isosceles triangle, practically full width of frons at its base and with anterior extension to ocellar tubercle. Further distinguished from *C. duplonotata* by dark brown to black undersized antennae with stubby basal plate with small dorsal right angle and gentle ventral angle opposite. Further distinguished from *C. improcerus* by presence of gently rounded ventral angle on basal plate and much darker palps and legs.

Female. Head. Eyes (relaxed) green, without hairs. Frons divergent, index 4.2, tomentum grey, with few short black hairs; vertex flat, vertical triangle greyish black with black hairs; ocellar tubercle bulging, shiny dark brown, anterior ocellus usually present. Callus shiny dark brown, bulging, triangular, almost full width of frons at base and lower lateral margins, extending to ocellar tubercle. Subcallus with grey brown tomentum, no hairs; parafacials and face grey, with black hairs; beard long mixed black and white hairs. Short, undersized antennal flagellum; scape and pedicel grey brown with black hairs; pedicel with short anterior prolongation; basal plate as wide as long, stubby, dark brown, with small dorsal right angle and gently rounded ventral angle opposite; Style black. Palpi grey-brown with dense black hairs.

Thorax. Scutum and scutellum dark grey with scattered short mixed black and white hairs. Pleura grey with black and white hairs.

Legs. Fore femora black with black hairs, remainder of legs dark brown with black hairs.

Wings. Brown, with brown suffusion in costal cell and along all veins, stigma brown.

Abdomen. Brown with black median vitta, short black hairs, no bands or median triangles on tergites. With patch of white hairs laterally on most tergites. Venter lighter brown, with black hairs, with narrow apical bands with fine white hairs on margins of sternites 2–6.

Distribution. Known only from type locality near Cooloolo, QLD.

Etymology. The specific epithet derives from the Latin for triangular and refers to the very large triangular callus of the species.

***Cydistomyia duplonotata* (Ricardo)**

(Fig. 33)

**Tabanus duplonotatus* Ricardo, 1914: 396; Froggatt 1915: 17; Ferguson 1920: 132; Ferguson & Hill 1920: 464; Surcouf 1921: 67; Hardy 1939: 42, 1944: 84; nec Taylor, 1917a: 755 (= *innotabilis* Walker); Chainey, 1990: 262. Holotype female, 3 female paratypes, from S Qld, (probably Deception Bay), in BMNH.

Cydistomyia duplonotata; Mackerras, 1959: 167; Daniels, 1989: 287; Bickel & Elliot, 1998-2005: 3.

Tabanus parvicallus; Taylor, 1917b: 524, 1918: 64, nec Ricardo, 1914: 394; Ferguson & Hill 1920: 464 (corrected misidentification).

Other material examined. 149 ♀, 5 ♂.

Diagnosis. A medium-sized species with grey scutum, yellowish brown abdomen with median dark vitta frequently enclosing narrower vitta of pale hairs, and bright orange basal plate on antennal flagellum contrasting with blackish brown style. Distinguished from *C. curvabilis* by this feature of antennae and absence of a recurved dorsal angle, differently shaped callus which is markedly less than full width of frons at base, darkened costal cell on wings, and characteristic abdominal pattern. To be distinguished from *C. improcerus* by pale coloured antennal scape and pedicel, and contrasting colours of basal plate and style, normal and not undersized antennal flagellum, dark brown costal cell, and slightly narrower frons with callus extending over greater width of frons at its base. Length 13–15 mm.

Female. Head. Eyes (relaxed) reddish green, bare (few short hairs just visible at 35X magnification). Frons parallel or slightly divergent, index 4.8–5.1, covered with dull fawn tomentum and short dark brown hairs; ocellar tubercle light brown, bare; callus brown, moderately shiny, slightly less than width of frons at base, with tapering slightly irregular extension usually reaching to junction of upper and middle third of frons. Subcallus and parafacials light fawn yellow; face more greyish; subcallus without hairs; parafacials and face with creamy hairs mixed with a few darker ones; beard yellowish cream. Antennal scape and pedicel light yellowish fawn, with black hairs; basal plate with acute dorsal angle forming short but conspicuous upward pointing tooth not recurved, bright orange to reddish brown, contrasting with dark brown to black style. Palpi yellowish cream, with light yellow and few short black hairs.

Thorax. Scutum and scutellum grey, with olive tint, paler on lateral margins and anteriorly, with erect black and appressed dull yellowish cream hairs; marginal hairs not conspicuous. Pleura grey, with dull cream hairs.

Legs. Femora dark grey, with yellowish cream and some black hairs; tibiae light brownish yellow, with similar hairs; tarsi darker brown, with dark brown hairs.

Wings. Lightly greyish; costal cell dark brown, subcostal cell paler brown; stigma brown, with brown suffusion along radial veins.

Abdomen. Light to medium yellowish brown, with broad median dark grey to blackish vitta which is invaded more or less by pale band at apices of tergites, with narrow median sometimes incomplete vitta of dull creamy hairs overlying the grey, sometimes enclosed pale vitta entirely absent. Abdominal hairs black, except for median vitta and yellowish cream hairs on extreme lateral margins. Venter light brown, with black

hairs, pale creamy-haired apical margins on all sternites.

Male. Closely similar to female but more hairy, legs darker, apical abdominal tergites very definitely darkened. Eyes bare (few short scattered hairs barely visible at 35X magnification), uniformly blackish, upper facets not appreciably enlarged. Ocellar tubercle conspicuous, ocelli not observed. Palps subcylindrical, tapering distally to gently rounded tip, fawn, with fine greyish white hairs mixed with a few black ones.

Distribution. Coastal SE QLD to Sydney NSW. **QLD:** Mullet Ck, Bundaberg, Mar., T.G. Campbell; Bundaberg, Oct., H. Frauca; Watalgan Ra., nr Bundaberg, 457 m, Oct., H. Frauca; 19 km S of Bundaberg (Wallum Reserve), Nov., H. Frauca; Childers, in heath community, Oct., H. Frauca; Eidsvold, Bancroft, Feb., M.J. Mackerras; Coast Ra., nr Biggenden, Oct.–Dec., H. Frauca; Bin Bin Ra., (via Didcot, W of Biggenden), Dec., H. Frauca; Mt Hastings Ck, 15 km S of Biggenden, Nov., H. Frauca; 64 km W of Maryborough; Bauple, S of Maryborough, Mar., Ridley; Murgon, Apr.; Mt Elliot, Cooloola Nat. Pk., Apr., J. and A. Skevington; Planted Ck via Tansey, Dec., G.B. and S.R. Monteith; Woolooga, Dec., J.W. Turner; Upper Noosa R., Nov., A.L. Dyce; Bunya Mountains Nat. Pk., Dec., G. Daniels and M.A. Schneider; Cooyar, biting in rainforest, Mar., E.N. Marks; Buderim Mt, biting, Oct., E.N. Marks; Mooloolah, Dec.; Glass House Mountains, Dec.; Beerburum, Nov., Wilkinson; Woodford, Nov.; Toorbul Point, biting, Jan., E.N. Marks; Deception Bay, Feb., I.M. and M.J. Mackerras; Brisbane, Oct., A.J. Turner, H. Hacker, Dec., G.H. Hardy, Feb.–Mar., H. Hacker; The Blunder, Brisbane, Oct., C.F. Ashby; Oxley, Deco, I.M. and M.J. Mackerras; Sunnybank, Oct., L. Pottinger; Wacol, Apr., A. Pritchard; Camp Mt, Oct., A. Pritchard, Feb., M.J. Mackerras, H.A. Standfast and R. Fieldhouse; Saltwater Ck, Brisbane, Mar., H.A. Standfast; Moggill, Jan., G. Wolf, Feb., D.M. Spratt; Lake Manchester, Mar., J.R. Wylie; Upper Cedar Ck, Dec., I.M. Mackerras; Mt Mistake, nr Laidley, Jan., D.M. Spratt; Ransome Reserve, Feb.; Blunder Ck, Brisbane, H. Evans and A. Hook; Flagstone Ck, Dec., B. Cantrell; Karawatha Forest, Nov., C.J. Burwell and Wright; Stradbroke Is., Dec., Feb., H. Hacker; Greenbank, Nov., H.A. Standfast; Kholo, nr Ipswich, Deco, M. Colbo; nr Tamborine, Mar., I.M. Mackerras, Kelly, Miller; Nerang, Oct.; Nerang R., 21 km from Nerang, nr Springbrook Forest, Dec., T.G. Campbell; Canungra, Nov., Bingham; “Glen Witheren” nr Canungra, Dec., G.B. Monteith; McPherson Ra., Feb.–Mar., A.J. Turner; West Burleigh, Nov., I.M. Mackerras; Springbrook, Mar., I.M. and M.J. Mackerras; Mt Lamington, Nov., M.D. Murray; Lamington Nat. Pk., May, I.J. MacKenzie. **NSW:** Bundjalung Nat. Pk., nr Evans Head, Jan.; Auburn, nr Sydney, May C.L. Lambkin.

***Cydistomyia improcerus* Mackerras & Spratt, sp. nov.**

(Figs. 11, 34)

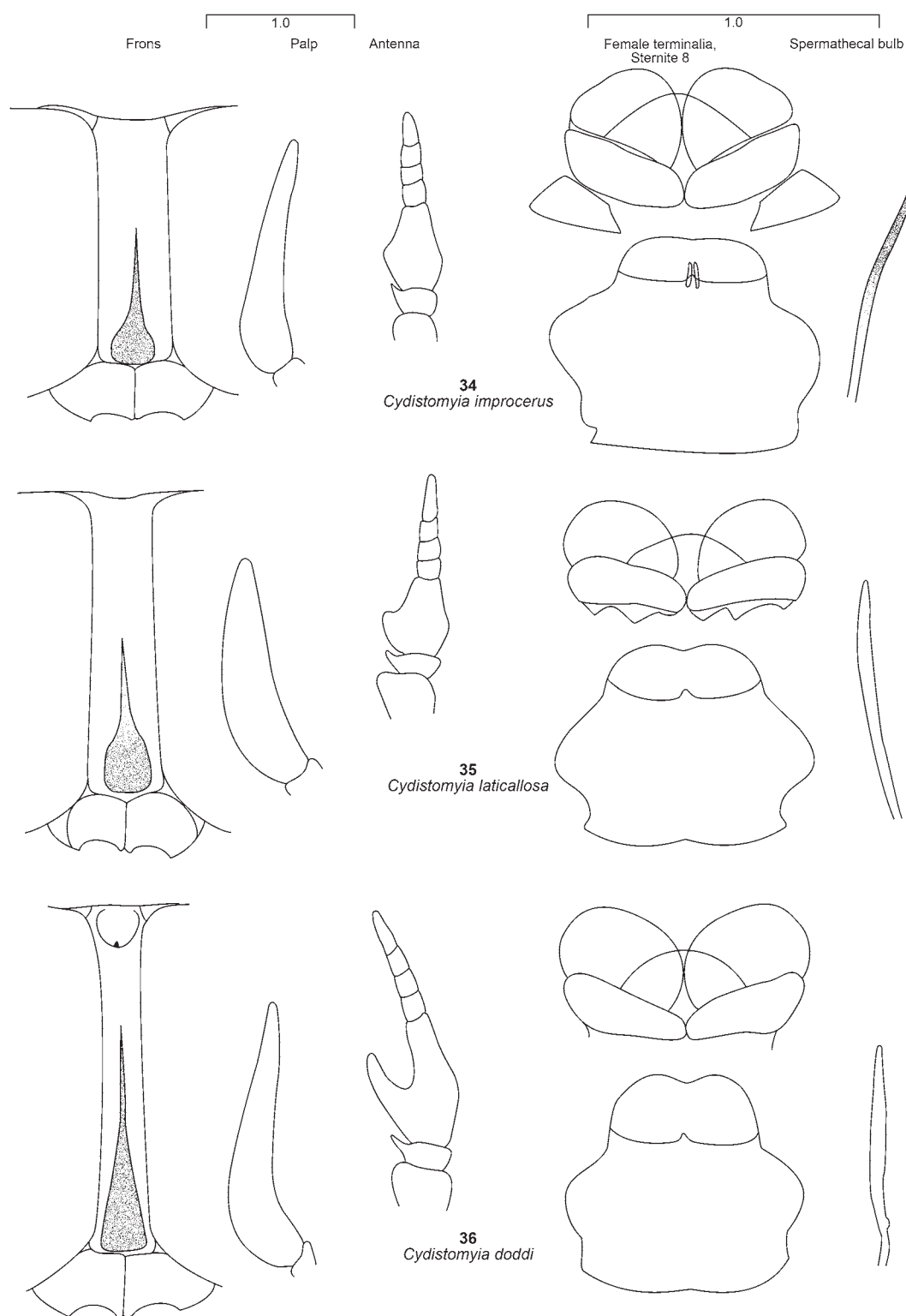
Type material. Holotype female, NSW, 24 km W of Ebor, Dec., 1952, I.M. and M.J. Mackerras (ANIC). Paratype males (16), NSW, Point Lookout, 1798 m, nr Ebor, on *Leptospermum*, Jan., 1952; 1 female, NSW, Barwick R., nr Ebor, NSW, Jan., 1962, J. Bancroft and I.M. Mackerras (ANIC).

Non-type material examined. **NSW:** 1 ♀ 15 km SW Ebor 12.xii.1984, D.K. Yeates (on *Leptospermum* blossoms) (UQIC); 1 ♀, 2 ♂ New England Nat. Pk., 3.i.1978, G. Daniels (GDCB).

Diagnosis. A medium-sized species closely related to *C. duplonotata* and exhibiting almost identical abdominal markings but distinguished from it by dark antennae, short undersized antennal flagellum, black basal plate with gently rounded dorsal angle, light brown costal cell, slightly wider frons with callus markedly less than width of frons at its base, and richer brown abdominal venter with narrow indistinct pale apical margins on sternites. Length 15–16 mm.

Female. Head. Eyes (relaxed) brown, with short scattered hairs just visible at 15X magnification. Frons parallel, index 3.3–4.9, with grey or fawn tomentum and short black hairs; ocellar tubercle shiny, light brown, bare; callus shiny, black, conspicuously less than width of frons at base, with tapering slightly irregular extension reaching almost to junction of upper and middle third of frons. Subcallus with fawn grey to brownish

tomentum, no hairs; parafacials and face with similar tomentum but with numerous black hairs among dull yellowish ones; beard greyish brown. Antennal scape and pedicel grey with long black hairs; flagellum under-sized, basal plate short, stubby, with gently rounded dorsal angle entirely black, not contrasting with short black style. Palpi brownish yellow, with predominantly black hairs.



FIGURES 34–36. 34. *Cydistomyia improcerus* Mackerras & Spratt, **sp. nov.** frons, palp, antenna, female terminalia, sternite 8, spermathecal bulb. 35. *Cydistomyia laticallosa* (Ricardo) frons, palp, antenna, female terminalia, sternite 8, spermathecal bulb. 36. *Cydistomyia doddi* (Taylor) frons, palp, antenna, female terminalia, sternite 8, spermathecal bulb.

Thorax. Scutum and scutellum dark grey, paler on lateral and posterior margins, with erect black and appressed dull yellowish brown hairs; marginal hairs not conspicuous. Pleura grey, with dull grey and black hairs.

Legs. Femora brown, with predominantly black hairs, anterior pair slightly darker than others; tibiae brown, with similar dark hairs; tarsi slightly darker brown, with black hairs.

Wings. Lightly greyish brown, with brown suffusion along margins of veins; costal and subcostal cells uniformly light brown.

Abdomen. Medium to dark yellowish brown, with median dark grey vitta indistinctly invaded by yellowish apical median patches (sometimes triangular) on tergites 2–6 overlain with dull creamy yellow hairs sometimes giving appearance of interrupted enclosed pale vitta. Abdominal hairs black except for those over median apical areas and for yellowish cream ones on lateral margins. Venter brown, with black hairs, pale apical margins on sternites barely discernible.

Male. Similar to female but a little darker and more hairy. Eyes with short dark hairs visible at 15X magnification, green in life brown when relaxed, upper facets not enlarged; ocellar tubercle present, ocelli not observed. Palpi fawn, with long black hairs mixed with few white ones, second segment characteristically plump basally, tapering almost uniformly to fine round tip.

Distribution. Known only from around Ebor NSW.

Etymology. The specific epithet refers to the short, undersized nature of the antennal flagellum.

Cydistomyia laticallosa (Ricardo)

(Fig. 35)

**Tabanus laticallosus* Ricardo, 1914: 395; Froggatt 1915: 17 (misspelled *luticallosus*); Taylor 1917b: 524; Surcouf 1921: 73; Ferguson & Hill 1922: 252; Hardy 1944: 84; Chainey, 1990; Holotype female, paratype female, from Moreton Island, south Qld (BMNH).

Cydistomyia laticallosa: Mackerras 1959: 167; Daniels, 1989: 287; Bickel & Elliot, 1998-2005: 4.

**Tabanus rufoabdominalis* Taylor, 1917b: 525; Ferguson: 1920: 132; Ferguson & Hill 1922: 252 (syn. of *laticallosus* Ric.); Mackerras 1959: 167 (confirmed synonymy). Syntypes, male and female, from Stradbroke Island, south Qld (QM).

**Tabanus heroni* Ferguson, 1921a: 372; Ferguson & Hill 1922: 252 (large var. of *laticallosus* Ric.); Hardy 1939: 42 (var. of *victoriensis* Ric., in Ferguson), 1944: 84. Holotype female, from Dorriggo, NSW (SAM).

Cydistomyia laticallosa var. *heroni*; Mackerras 1959: 167.

Other material examined. 24 ♀, 8 ♂.

Diagnosis. A medium to large-sized brown species with some variable brown suffusion on the wings. To be distinguished from *C. improcerus* and *C. duplonotata* by less conspicuous abdominal pattern — the interrupted or sometimes complete narrow dark median vitta bearing almost no indication of an internal pale vitta or median pale apical triangles on the tergites, elongate grey-black basal plate with acute dorsal angle, robust dark grey palpi, generally narrower frons, and often more bulging broader callus. Length 14–19 mm.

Female. Head. Eyes green in life, bare (fine hairs just visible at 35X magnification). Frons narrow, parallel, index 4.7–5.9, covered with rather dark fawn-brown or greyish cream tomentum and short dark hairs; vertex flat; vertical triangle ill-defined, ocellar tubercle prominent and partly shiny, indications of three ocellar spots, anterior spot best defined; callus oblong, about three-fourths width of frons at base, with irregularly tapered extension to upper third of frons, portion just above main callus somewhat hollow and irregular. Subcallus with dull fawn to creamy tomentum, without hairs; parafacials with dull greyish fawn to greyish cream tomentum, short black hairs, some longer golden ones on lower part; face more greyish, with some black hairs above and a few golden ones below; beard yellow to dull creamy. Antennae relatively slender, uniformly greyish black, with short black hairs throughout, basal portion of flagellum elongate with acute dorsal angle

forming short but sharp upwardly pointing tooth. Palpi dull greyish fawn, with short dark hairs.

Thorax. Scutum and scutellum dark brown with faint olive hue, greyish anteriorly and on side margins, with irregular black and rather sparse yellow hairs. Supra and postalar tufts and marginal hairs on scutellum yellow. Pleura grey to light fawn, with yellow to deep orange-yellow hairs.

Legs. Black; hairs black, except for some admixture of orange-yellow ones on femora.

Wings. Light greyish, with faint brownish hue; costal cell brown, variable and irregular light brownish suffusion in radial area beyond first basal cell; stigma dark brown.

Abdomen. Reddish brown, with vague blackening in median area of tergites and more extensively on fifth and subsequent tergites; hairs black, except for yellow apical fringe, small median apical yellow to cream triangles and yellow lateral margins on tergites 2–5. Venter bright brown basally, darker on apical sternites, with pale yellow-haired apical margins to all sternites, hairs mixed yellow and black elsewhere.

Male. Similar to female but dark median markings on second abdominal tergite more prominent. Eyes bare (few scattered hairs just visible at 35X magnification), green, meeting in mid line, upper facets not enlarged. Ocellar tubercle prominent, raised above level of eyes, ocelli not observed. Palpi grey to light fawn, gently tapering to rounded point, with long black and creamy yellow hairs. Legs more brownish than in female, hind tibial fringe stronger.

Distribution. Coastal SE QLD to NE NSW. **QLD:** Kroombit Tops, 45 km SSW of Calliope, Dec., G. Monteith and G. Thompson; Point Vernon, via Maryborough, Dec., H.A. Standfast; Noosa, Oct.; Woombye, Dec., D.H. Colless; Deep Water Nat. Pk., 65 km NW of Bundaberg, Sept., G.B. and S.R. Monteith; Brisbane, F.H. Taylor; Dunwich, Oct., Stradbroke Is., Sept., H. Hacker, J.B. Cleland, Oct., H. Hacker, I.M. and M.J. Mackerras. **NSW:** Byron Bay, Nov., Marr; Bangalow, Nov., Marr; Ballina, Jan.; Meldrum, Dec., Raven; Surveyor's Ck, Gibraltar Ra. Nat. Pk., Jan., J. and A. Skevington.

Remarks. Two forms were previously recognised: the *laticullosa* (Ricardo) form and the generally larger and more broadly built *heroni* (Ferguson) form. There is considerable variation in size and in the degree of suffusion along wing veins, and distributions overlap.

One specimen in QM is difficult to place. A female from Fraser Is., Qld., Nov., H. Burton has the same very slender antennae and plump palpi but has a reddish brown abdomen without a dark median vitta, with black mottling on the fourth and subsequent tergites, without yellow apical fringes and small median apical yellow triangles on the tergites but with yellow lateral margins on tergites 1–6. The specimen has an indistinct ocellar tubercle, more white than yellow beard, antennae with a slight ventral bulge opposite the sharp upward pointing tooth on the orange brown basal plate contrasting with greyish black style, greyish black scutum and scutellum more brown on side margins, with brown rather than black legs and with faint brownish wings with no suggestion of brown suffusion in the radial area beyond the first basal cell or along wing veins.

Cydistomyia doddi (Taylor)

(Figs. 4, 36)

Tabanus abstersus; Taylor, 1913: 60, *nec* Walker, 1850: 58 (= *Dasybasis circumdatus* (Walk.)) Austen, 1914: 264 (notes misidentification).

**Tabanus doddi* Taylor, 1917a: 758 (proposed as replacement name for *abstersus* Tayl. *nec* Walk.); Ferguson 1921a: 373; Surcouf 1921: 66; Hardy 1944: 83; Chainey, 1990: 262. Syntypes, 1 female (ANIC), 1 female (BMNH), from Kuranda, north Qld..

Cydistomyia doddi; Mackerras 1959: 167; Daniels, 1989: 287; Bickel & Elliot, 1998-2005: 3.

Note. This species is quite distinct from the type of the genus, *Cydistomyia doddi* Taylor, 1919: 47, which was described as from Kuranda, north Qld., but was shown by Oldroyd (1947: 343) to be a synonym of *Cydistomyia albithorax* (Ricardo, 1913), which is restricted to New Guinea.

Other material examined. 224 ♀, 2 ♂.

Diagnosis. A medium to large blackish species with light grey pleura, distinctly darkened wings in apical half, ashy grey median spots and lateral triangles on abdominal tergites, and distinctive strongly hooked dorsal angle on basal plate of antennal flagellum. Length 14–17 mm.

This species, *C. magnetica*, *C. alternata*, and *C. wentworthi* form a north to south array of closely related, dark-winged, dark-bodied species with frons increasing in width (frons index decreasing) from north to south and leading into the large southern *C. victoriensis*, with *C. pruina* forming a natural link between *C. wentworthi* and *C. victoriensis*. The new species, *C. fenestra*, distributed from Cape York Peninsula to mid-New South Wales has previously been confused with both *C. alternata* and *C. wentworthi*, particularly when geographic distribution was given more weight than morphological features of either the wings or the antennae. Of this cluster of species, only *C. fenestra* has green eyes (relaxed) and all black hairs on palpal segments 1 and 2.

Female. Head. Eyes (relaxed) blackish, bare (short sparse hairs easily visible at 35X magnification). Frons narrow, parallel or slightly divergent, index 5.8–7.3, with dull fawn-brown tomentum and short black hairs; vertex not hollow; vertical triangle greyish, slightly shiny; ocellar tubercle well-defined, raised, brown, ocelli not visible; callus raised, elongate, tapering, shiny, black, slightly less than width of frons at base and with extension reaching upper fourth of frons. Subcallus smooth, with ashy tomentum, without hairs; parafacials with ashy tomentum and short black and greyish white hairs; face with pale grey tomentum, a little darker than parafacials, with rather sparse fine black hairs above; beard white. Antennal scape with greyish tomentum, short black hairs, moderately developed dorsal prolongation; pedicel blackish brown, with well-developed dorsal prolongation, short black hairs; basal plate brownish black, with dorsal angle produced into strong forwardly directed tooth reaching about one half to two-thirds of the way to base of style; style black slender, slightly longer than basal section. Palpi with ashy tomentum and white hairs on basal half of segment 2, grey speckled tomentum and short black hairs on distal half, mixed greyish white and black hairs on palpal segment 1. Labella with inconspicuous lateral chitinised bar.

Thorax. Scutum and scutellum dark brown with olive hue, with traces of darker median and dorsocentral lines, greyish on lateral margins, with short black and scanty appressed yellowish hairs; marginal hairs black in front of wing root, mixed black and white to yellowish behind it. Pleura pale grey, with white hairs, contrasting with dark scutum.

Legs. Black, slender; hairs black, except for ventral and basal fringe on femora.

Wings. Distinctly suffused with light greyish brown, costal cell entirely brown; irregular dark brown suffusion along radial and median veins from tip of R_{2+3} , fork of R_{4+5} , apex of discal cell, and along Cu_1 .

Abdomen. Blackish brown, first segment dark brown in middle basally, grey along hind margins, ashy grey laterally; subsequent segments brownish black in middle third, dark brown laterally, with barely indicated paler apical margins; conspicuous white-haired small median apical spots on tergites 1–5, larger lateral apical white-haired triangles on tergites 2–5; those on tergite 5 extend medially to make pale apical margin more definite than on other segments; elsewhere hairs black. Venter black, greyish in centre of first and second sternites, with grey to ashy white haired apical margins on sternites 2–5; elsewhere hairs black.

Male. Similar to female but more brownish, scutum with dense appressed dull yellow hairs. Eyes bare (scattered short hairs easily visible at 35X magnification), (relaxed) green or greenish red, meeting in mid line, upper facets not appreciably enlarged nor differentiated from lower. Ocellar tubercle well developed, oval, brown, without hairs, projecting slightly above level of eyes; basal plate of antennal flagellum more slender and tooth not projecting forward as far as in female. Palpi elongate-conical, tapering to rounded point, with long white hairs basally, shorter black ones apically. Pale apical margins of abdominal tergites more clearly defined than in female.

Distribution. Cape York to Mackay N QLD. **QLD:** 8 km N of Bloomfield R., May, S.R. Curtis; Bloomfield, Dec., T.M. Moulds; Cape Tribulation, Dec., Jan., G.B. Monteith, Apr., I. Beveridge; Noah Ck, 8 km S of Cape Tribulation, Sept., G.B. Monteith;; 16 km S of Daintree, Apr., K.R. Norris; Bamboo Ck, nr Miallo, N of

Mossman, Colless; Mossman Gorge, Dec., D. Gibson, Apr., D.H. Colless; Mossman, F.H. Taylor; 5 km W of Mossman, Mar., I.F.B. Common and M.S. Upton; Simpson Point, 32 km N of Cairns, Mar., T.G. Campbell; Myola; nr Julatten, Dec., E. Britton; Kuranda, F.P. Dodd; 7.5 km NW of Kuranda, Feb., Storey and Halfpapp; Mt Lewis, 914 m, rainforest, Oct., E. Britton; Barron R., 2 km N of Redlynch, Mar., T.G. Campbell; Cairns, Dodd, Lea, Taylor; Crystal Cascades, Cairns, Mar., I.F.B. Common and M.S. Upton; Glen Boughton, 32 km from Cairns, Mar., T.G. Campbell; Whitfield Ra. Forest Reserve, Cairns, Apr., D.H. Colless; Hill Ck via Yarrabah, Apr., C.R. Pavey; Dejinghe Ck, 5 km SW of Yarrabah, Oct., E. Britton and R. Trumble; Kairi Ck, Tinaroo, Feb., D. Gibson; Kauri Ck, Danbulla SF, Jan., D. Gibson; Cathedral Fig, Severin Ck, Danbulla SF, Jan., D. Gibson; Russell Road at Bellenden Ker Landing, Oct.; Upper Mulgrave R., via Gordonvale, Apr., S.R. Curtis; Mulgrave R.; Meerawa, Jun., A.N. Burns; Quingilli, Apr., T.G. Campbell; Deeral, Apr., T.G. Campbell; Bramston Beach, nr Babinda, biting, Aug.–Oct., I.M. and M.J. Mackerras, Elliott; Mt Bartle Frere, Apr., K.R. Norris; Herberton, 914 m, Dec., Dodd; Henrietta Ck, Palmerston Nat. Pk, Apr., S.R. Curtis; Crawford's Lookout, Palmerston Nat. Pk, Jan., P. Ferrar; 32 km S of Ravenshoe, 670 m, Mar., I.F.B. Common and M.S. Upton; Erchee Res. Stn., via Innisfail, Feb., D. Gibson; Innisfail, Fahey, F.H. Taylor, Feb., biting, I.M. Mackerras, Apr., R. Domrow; Dinner Ck, nr Innisfail, at light, Nov., E. Britton, Feb., H.A. Standfast and B. Kay, Mar., H.A. Standfast, Apr., M.J. Mackerras, T.G. Campbell; Nind's Ck, nr Innisfail, Feb., H.A. Standfast and B. Kay; Gooligan Ck, nr Innisfail, Apr., K.Y. Harrison; Mourilyan, Oct., A.L. Dyce; Miskin Ck, nr Mena Creek, May, T.G. Campbell; Upper Mulgrave Road, Kearneys Falls, Dec., G.B. Monteith and Thompson; Stone Ck via Garradunga, G.B. Monteith and C.J. Burwell; Flying Fish Point, Jan., E.C. Dahms; Cardwell Ra., Dec., G.B. Monteith and Hanlet; Tully Falls, Feb., D. Gibson; Cardstone, Jan., P. Carne and E. Britton, Apr., Palmerston Hwy. Tully, Feb., D. Gibson; I. Beveridge; 6 km E. of El Arish, May, T.G. Campbell; Dunk Is., Jan., P. McIndoe; Lacey's Ck, Mission Beach, Apr., S.R. Curtis; 3 km W of Mission Beach, Apr., I.F.B. Common and M.S. Upton; 8 km NE of Tully, Apr., K.R. Norris; Cardstone via Tully Falls, May, G.B. Monteith and D.K. Yeates; Bingil Bay, E of Tully, May, T.G. Campbell; Tully, May, T.G. Campbell, F.H. Taylor; 8 km W of Tully, Apr., K.R. Norris; Hinchinbrook Is., May, S.G. Wright; Upper Broadwater Ck; 20 km N of Townsville, Jan., S.J. Johnston; Townsville, Dodd; Ching Do, F.H. Taylor, J.L. Humphrey; Bowen, Mar., T.G. Campbell; Mackay, Apr., A.N. Burns; Eungella Nat. Pk, 731 m, Mar., I.F.B. Common and M.S. Upton.

Cydistomyia magnetica (Ferguson & Hill)

(Figs. 5, 37)

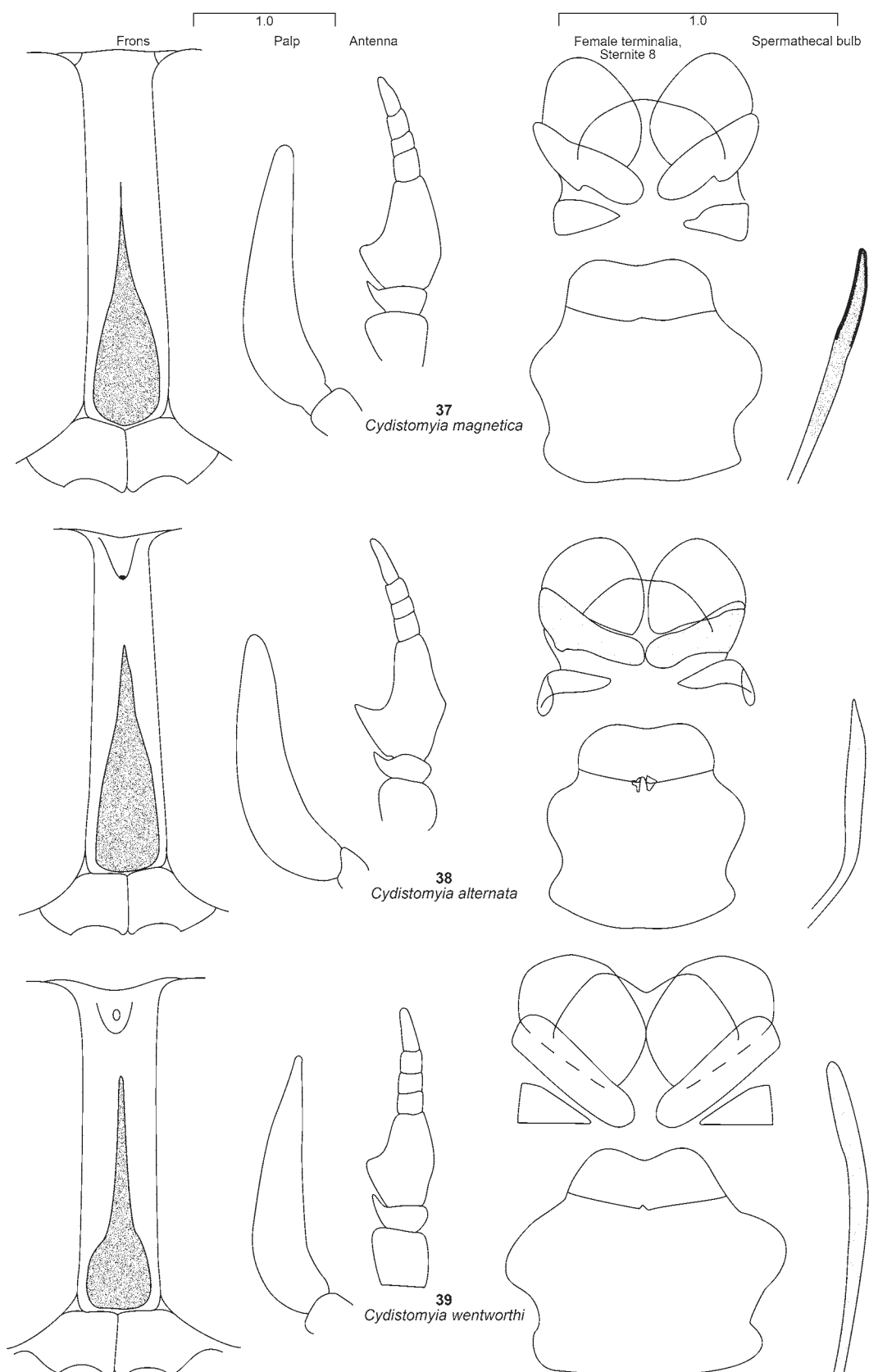
Tabanus alternatus var. *magneticus* Ferguson & Hill, 1922: 258; Hardy 1944: 84. Holotype female, from Magnetic Island, north Qld (ANIC).

Cydistomyia magnetica; Mackerras 1959: 167; Daniels, 1989: 287; Bickel & Elliot, 1998–2005: 4.

Other material examined. 28 ♀, 1 ♂.

Diagnosis. A medium to large dark blackish species closely related to *C. doddi* but distinguished from it by slightly wider frons, clearly defined anterior ocellar spot, oblong callus with narrow extension, more uniform brown clouding on wings, definite median triangles on tergites 2–4, and basal plate of antennal flagellum with sharp upwardly directed dorsal tooth which does not project anteriorly. Length 13–17 mm.

Female. Head. Eyes (relaxed) blackish, bare (short sparse hairs easily visible at 35X magnification). Frons narrow, parallel or slightly divergent, index 4.3–5.3, with dull fawn-brown tomentum on upper half and grey tomentum on lower half, short black hairs overall; vertex not hollow, vertical triangle black; ocellar tubercle well-defined, raised, blackish brown, anterior ocellar spot clearly defined, posterior ocelli not visible; callus raised, oblong, with narrow extension to upper third of frons, shiny, black, slightly less than width of frons at base. Subcallus smooth, with ashy tomentum becoming fawnish brown over antennae, without hairs; parafacials with ashy tomentum and short predominantly white hairs; face with pale grey tomentum, rather



FIGURES 37–39. 37. *Cydistomyia magnetica* (Ferguson & Hill) frons, palp, antenna, female terminalia, sternite 8, spermathecal bulb. 38. *Cydistomyia alternata* (Ferguson & Hill) frons, palp, antenna, female terminalia, sternite 8, spermathecal bulb. 39. *Cydistomyia wentworthi* (Ferguson & Hill) frons, palp, antenna, female terminalia, sternite 8, spermathecal bulb.

sparse fine black hairs above; beard white. Antennal scape with greyish black tomentum, short coarse black hairs, moderately developed dorsal prolongation; pedicel blackish brown, with well developed dorsal prolongation, short coarse black hairs; basal plate brownish black, with dorsal angle forming sharp upwardly directed tooth which does not project forward; style slender, black, approximately same length as basal section. Palpi with ashy tomentum and white hairs on basal half of segment 2, grey speckled tomentum and short black hairs on distal half, mixed greyish white and black hairs on palpal segment 1. Labella with inconspicuous lateral chitinated bar, less definite than in *doddi*.

Thorax. Scutum and scutellum dark brown with olive hue, with traces of darker median and dorsocentral lines, greyish on lateral margins, with short black and scanty appressed yellow hairs; marginal hairs black in front of wing root, mixed black and white with a few yellowish ones behind it. Pleura pale grey with white hairs, contrasting with dark scutum.

Legs. Black, slender; hairs black except for ventral and basal pale grey fringe on femora.

Wings. Distinctly and almost uniformly suffused with greyish brown from apices of basal cells to near tip of R_{2+3} and backward through marginal cells to cua_1 , vague clearer areas present in R_{2+3} and d; costal cell entirely brown.

Abdomen. Blackish brown, first tergite dark brown in middle basally, grey along hind margins, ashy grey laterally; subsequent tergites brownish black in middle third, dark brown laterally, with narrow pale apical margins on 2nd and 3rd tergites, wider more conspicuous pale apical band on 4th tergite; conspicuous small median white-haired apical spots on 1st and 5th tergites, widening into definite white-haired median triangles on tergites 2–4, lateral apical white-haired triangles on tergites 2–4, elsewhere hairs black. Venter blackish brown, greyish in centre of 1st and 2nd sternites, with grey to ashy white haired apical margins on sternites 2–4, elsewhere hairs black.

Male. Similar to female but darker in colour, without pale apical bands and median triangles on tergites 2–4. Eyes bare (scattered short hairs visible at 35X magnification), (relaxed) red to reddish brown, meeting in mid line, upper facets not appreciably enlarged nor differentiated from lower ones. Scutum with sparse appressed dull yellowish hairs, with longer golden yellowish hairs marginally, particularly above wing root and on dark pleura. Ocellar tubercle well developed, oval, blackish brown, without hairs, projecting slightly above level of eyes. Basal plate of antennal flagellum more slender. Palpi elongate, conical, with bluntly rounded point, long white hairs basally, shorter black hairs with a few white ones apically.

Distribution. Magnetic Island to N of Warwick QLD. **QLD:** Magnetic Is., Nov., G.F. Hill, Dec., I.M. Mackerras; Little Crystal Ck, Mt Spec, biting, Nov., I.M. Mackerras; The Saddle, 8 km E of Paluma, Apr., P. Ferrar; Plane Ck; Mackay, Nov.; Sarina, Jan.–Feb.; Yeppoon, Sept., G.M. Goldfinch; Port Curtis; Townsville, Dodd; Cape Upstart, Shark Bay, Apr., G.B. Monteith; Carlisle Is., Dec., S.R. Monteith; Byfield State Forest, Jan., G. Daniels; Westwood, W of Rockhampton, Nov., R. Eastwood; Blackdown Tableland via Dingo, Feb., G.B. Monteith; Bluff Ra., nr Biggenden, Dec.–Jan., H. Frauca; Coast Ra., nr. Biggenden, Jan., H. Frauca; Mt Walsh Nat. Pk., 11 km S of Biggenden, Dec.–Jan., H. Frauca; 2.5 km NE of Landsborough, Mar., G.B. Monteith; Mooloolabah, Oct., C.F. Ashby; Boolomba Ck, Conondale Ra., Dec., G.J. Ingram; Mt Huntley, Jan., G.B. Monteith;

Cydistomyia alternata (Ferguson & Hill)

(Figs. 6, 38)

Tabanus limbatinevris Macquart, 1850: 29 [Preoccupied by Macquart, 1847], Nearctic; Froggatt 1911: 15, 1915: 15; Surcouf 1921: 73; Mackerras 1959: 167 (syn. of *alternatus* Ferguson & Hill). Holotype female, from east coast of New Holland, stated to be in MNHN.

Tabanus macquarti Ricardo, 1915a: 277 (replacement name for *limbatinevris* Macquart, 1850) [Preoccupied by Schiner, 1868, Neotropical]; Froggatt 1915: 17; Ricardo 1917: 219; Taylor 1918: 65, 1919: 57; Ferguson & Henry 1920: 842;

Ferguson 1920: 132, 1921a: 373; Surcouf 1921: 73 (notes nom. preocc.).
Tabanus alternatus Ferguson & Hill, 1922: 258 (replacement name for *macquarti*) Ricardo, 1915); Hardy 1939: 42, 1944: 83.
Cydistomyia alternata; Mackerras 1959: 167; Daniels, 1989: 286; Bickel & Elliot, 1998-2005: 2.
Other material examined. 191 ♀, 7 ♂.

Diagnosis. A medium to large dark blackish species similar to *C. doddi* and *C. magnetica*. Distinguished from former by wider frons and callus (particularly at their bases), more brown colouration of abdomen and only slight forward projection of dorsal tooth on basal plate of antennal flagellum. To be distinguished from *C. magnetica* by less uniform brown clouding on wings which is restricted essentially to brown suffusion along wing veins, less oblong callus with broader more tapering extension and slight forward projection of dorsal tooth on basal plate. Length 13–17 mm.

Female. Head. Eyes (relaxed) blackish, bare (short sparse hairs visible at 35X magnification). Frons narrow, parallel or slightly divergent, index 4.5–5.7, with dull fawn-brown tomentum and short black hairs; vertex not hollow; vertical triangle greyish, with long black hairs; ocellar tubercle well defined, raised, brown, slightly shiny, ocelli not visible; callus raised, elongate, tapering, shiny, black, less than width of frons at base, extension reaching upper third of frons. Subcallus smooth, with yellowish fawn tomentum, without hairs; parafacials and face with fawnish grey tomentum, short dull yellowish hairs mixed with black and white ones; beard dull yellowish. Antennal scape with greyish tomentum, long black hairs, moderately developed dorsal prolongation; pedicel blackish brown, with black hairs and well-developed dorsal prolongation; basal plate brownish black, with conspicuous dorsal angle forming short tooth which tends to project forward slightly; style slender, black, about same length as basal plate. Palpi with ashy tomentum and greyish white hairs on basal half of segment 2, grey speckled tomentum and short predominantly dull yellowish and black hairs on distal half, mixed black and greyish white hairs on palpal segment 1. Labella with inconspicuous lateral chitinated bar, much less definite than in *C. doddi*.

Thorax. Scutum and scutellum greyish brown, with traces of darker median and dorsocentral lines, lighter brownish grey on lateral margins, with short black and scanty appressed yellowish hairs; marginal hairs black in front of wing root, mixed black and white to yellowish behind it. Pleura pale grey, with yellowish hairs.

Legs. Femora and tarsi black, with black hairs; tibiae brown on basal half, with predominantly black hairs, some yellow hairs on basal half of hind tibiae.

Wings. Distinctly suffused with light greyish brown, costal cell entirely brown; irregular dark brown suffusion along radial and median veins from three quarters the length of R_{2+3} , around the discal cell, and along CuA_1 and sometimes CuA_2 . (The wing markings are closer to those of *doddi* than to *magnetica*).

Abdomen. Blackish brown, darkening in median third on 2nd and 3rd tergites and extensively on remainder; narrow pale apical margins on tergites, broadening to form pale median triangles on tergites 1–4, yellow-golden hairs on median and lateral triangles and on 1–5 (not as conspicuous as in *magnetica*) and forming pale lateral triangles and on pale apical band on fourth tergite, elsewhere hairs black. Venter brown with conspicuous pale apical margins on sternites 2–7, yellow-golden hairs over pale bands on sternites 2–4, mixed yellow-golden and black elsewhere.

Male. Similar to female but with more yellow-golden hairs on face, parafacials, beard, pleura and femora, and with much paler abdominal venter. Eyes bare (scattered short hairs visible at 35X magnification), (relaxed) green, meeting in mid line, upper facets not appreciably enlarged nor differentiated from lower ones. Ocellar tubercle well developed, oval, blackish brown, without hairs, projecting only slightly above level of eyes. Palpi fawn-brown, elongate, conical, with bluntly rounded tip, with long white hairs basally and shorter black hairs mixed with white ones apically.

Distribution. Central coastal QLD to S of Port Macquarie NSW. **QLD:** Bowen, Nov., S. Misko; Broken R., 80 km W of Mackay, Nov., E Britton and S. Misko; Eungella W of Mackay, Jan., M.S. & B.J. Moulds;

Byfield, Jan., I.F.B. Common, Apr., T.G. Campbell; Blackall Ra., Jan., C. Borch; Eidsvold, Jan., M.J. Mackerras; Tin Can Bay, Jan., H.A. Standfast, July; Cooran, May, Davis; Brown's Ck, Eumundi, Jan.; Boreen Point, Apr., E.N. Marks; Upper Noosa R., Nov., A.L. Dyce; Wappa Falls, Yandina, Mar., H.A. Standfast; Didillibah, nr Nambour, Mar., T.G. Campbell; Woombye, Oct., Dec., D.H. Colless; Montville, Mar.; Mountain Ck, Buderim, biting, Oct., E.N. Marks; Mooloolabah, Dec, K.R. Norris, Apr., biting, E.N. Marks; Glass House Mountains, Dec., I.M. Mackerras; Woodford, Nov.; Caloundra, Oct., Wild; Landsborough, Jan., E.N. Marks, Mar.–Apr., H.A. Standfast; Peachester, Dec., M. Colbo; Bribie Is., Apr., I.M. Mackerras; Woorim, Bribie Is., biting, Feb., E.N. marks; Saltwater Ck, Brisbane, Mar., H.A. Standfast; Sunnybank, Dec., L. Pottinger; Pimpama, Dec.–Jan., K.R. Norris; Jumpin Pin, Mar., B. Kay; Southport, Feb., D.M. Spratt; Mt Tamborine, Nov., J.W. Davidson; Canungra, May, Sharp, biting, H.A. Standfast; “Glen Witheren”, nr Canungra, Dec., Jan., G.B. Monteith; Surprise Rock, Binna Burra, Nov., biting, Nov., I.M. and M.J. Mackerras; Bruce Highway, Oct., C.F. Ashby; Springbrook, Dec., D.C. Lack; Lamington Nat. Pk., Nov., F.A. Perkins, Feb., I.C. Yeo, H.G. Greening. **NSW**: Tweed Heads, Nov., Rohigras; Brunswick Heads, Jan., K.R. Norris, Feb., D.E. Havenstein; Richmond R., Feb., Dec., D.K. Yeates; Byron Bay, Dec., Marr; Byron Bay lighthouse, Feb., R. Sheridan; Bangalow, Nov., Marr; Tregeagle, 10 km SE of Lismore, Dec., D.K. Yeates; North Ballina, Nov.–Jan.; East Ballina, Feb., C.E. Chadwick; Coraki, Nov., I.F.B. Common; Kilgin, Richmond R., Dec.; Bundjalung Nat. Pk. nr Evans Head, Jan., C.L. Lambkin; Summit Mountain, Gibraltar Ra. Nat. Pk., Nov., D.K. Yeates; Grafton, Apr., M.E. Fuller; Kangaroo River SF, Dec., S. Evans and J. Wright; Wild Cattle Creek SF, Dec., S. Evans and J. Wright; Bellbird SF, nr Mt Lindsay, Nov., G. Daniels and Schneider; Coffs Harbour, Oct., Feb., T.G. Campbell; Boambee, Feb., T.G. Campbell; Ebor, Jan., M.E. Fuller; 15 km SW of Ebor; Broadwater, Nov., Baber, Mar.; Nambucca Heads, Dec.–Jan., H. Grey, Jan., J.B. Cleland; Scott's Head, nr Worrell Ck, Feb., D.H. Colless; Macleay R., Jan.; Yarrahapinnie, nr Kempsey, Mar., T.G. Campbell; Port Macquarie, Jan., M.F. Day, Feb.; Kendall, Jan.–Feb., Harrington, Mar., T.G. Campbell; The Pinnacle, Wiangaree SF, Dec., C. Hagan; Kundibakh, C. Dennes.

***Cydistomyia wentworthi* (Ferguson & Hill)**

(Fig. 39)

**Tabanus wentworthi* Ferguson & Hill, 1922: 259; Hardy 1939: 42, 1944: 84. Holotype female, paratype male from Leura, Blue Mountains, NSW (AM).

Cydistomyia wentworthi; Mackerras 1959: 168; Daniels, 1989: 288; Bickel & Elliot, 1998–2005: 5.

Other material examined. 15 ♀, 3 ♂.

Diagnosis. A medium to large species closely resembling *C. doddi*, *C. magnetica* and *C. alternata* but distinguished from them by wider frons, much less pronounced dorsal angle with smaller upward pointing tooth on basal plate of antennal flagellum, and absence of discrete brown cloud in apical half of wing. Length 13–17 mm.

Female. Head. Eyes (relaxed) black, bare (short hairs visible at 35X magnification). Frons relatively narrow, parallel or slightly divergent, index 4.0–4.6, with dull fawn-brown tomentum and short black hairs; vertex not hollow; vertical triangle greyish, with long black hairs; ocellar tubercle well defined, raised, brown, slightly shiny, ocelli not visible; callus quadrate, almost full width of frons at base, with tapering extension which at its base is about one-third width of upper edge of callus and extends almost to ocellar tubercle. Subcallus with greyish cream tomentum, yellowish above base of antennae, without hairs; parafacials and face with grey tomentum, with predominantly dark hairs; beard greyish white, with a few black hairs. Antennal scape and pedicel with greyish fawn tomentum, with black hairs, moderate dorsal prolongation on pedicel; basal plate slender, brownish black, with weak dorsal angle and small upward pointing dorsal tooth which does not project anteriorly. Palpi brown, more yellowish at tip, with black hairs on segment 2 and mixed black

and greyish white or all greyish white on palpal segment 1.

Thorax. Scutum and scutellum greyish brown, with traces of darker median and dorsocentral lines, lighter brownish grey on lateral margins, with short black and scanty appressed yellowish hairs; marginal hairs black in front of wing root, white to yellowish behind it. Pleura pale grey, hairs creamy white, some black ones on upper mesopleural convexity.

Legs. Femora dark brown, with mixed short black and longer white hairs, fore femora generally darker than others; tibiae brown at least on basal half, with entirely black hairs; tarsi generally darker, with black hairs.

Wings. Greyish, costal cell brown; all veins narrowly margined with brown and with clear window in basal portion of cell R_1 extending apically to basal edge of stigma. There is no discrete brown cloud in apical half of wing as is found in preceding three species but rather more uniform suffusion in cells of basal two-thirds of wing.

Abdomen. Blackish brown, first tergite dark brown in middle basally, grey along hind margins, ashy grey laterally; subsequent tergites brownish black in middle third, dark brown laterally, with paler apical margins; small white-haired semilunar median and lateral apical spots on tergites 1–5, elsewhere hairs black. Venter dark brown, greyish in centre of 1st and 2nd sternites, with grey to fishy white haired apical margins and white haired lateral areas on sternites 1–5, elsewhere hairs black.

Male. Similar to female but more brown in colour. Eyes (relaxed) black, contiguous, bare (short hairs easily visible at 35X magnification), upper facets not appreciably enlarged nor differentiated from lower. Ocellar tubercle prominent, projecting above level of eyes, with three small but distinct brown spots representing ocelli. Palpi subcylindrical, tapering rather abruptly to point, bright brown, with fairly dense black and some creamy hairs. Legs somewhat more brownish than in female. Dark markings along wing veins less evident. Abdomen brown, darker in median area, with dense pale hairs on median triangles, apical edges, and lateral triangles of tergites.

Remarks. Four specimens from Wilson's Promontory, Vic., are here placed as variants of *C. wentworthi*. They differ mainly in the shape of the callus which is not quadrate but rather with gently tapering shoulders, although the extension usually reaches the ocellar tubercle. In addition, the cream to creamy white hairs forming median and lateral apical spots on the tergites extend along the pale apical margins forming incomplete haired bands approaching those seen in *C. pruina*. In some specimens the dorsal prolongation on the antennal pedicel is pronounced and similar to that seen in *C. victoriensis*. The brown costal cell and brown suffusion along the wing veins, as well as dark femora contrasting with lighter brown tibiae, immediately distinguish these specimens from *C. pruina*. The smaller size, abdominal markings, colour of legs, and shape of basal plate distinguish them from *C. victoriensis*.

Distribution. Inland NSW from near Glen Innes to Wilsons' Promontory VIC. NSW: Washpool Nat. Pk., nr Glen Innes, Jan., J. and A. Skevington; Leura, Jan., W.W. Froggatt; Wentworth Falls, F.H. Taylor, Nov., A. Tonnoir; Blackheath, Feb., A.J. Nicholson, I.M. Mackerras; Katoomba, Dec., S.S. Sekhon; Blue Mountains, Jan., C. Deuquet. VIC: Wilson's Promontory, Jan.–Feb., G.W. Douglas, Jan., A.J. Nicholson.

Cydistomyia fenestra Mackerras & Spratt, sp. nov.

(Fig. 40)

Type material. Holotype female, north Qld, Kingfisher Lodge, Julatten, 400 m, Nov., 1998, C.J. Burwell (QM T144398).

Paratype female, same data as holotype (QM).

Non-type material examined QLD, 1♀, Annan R. crossing, S of Helenvale, Jan., 1981, G. and A. Daniels (GDCB); 1♂, Mt Finnigan summit, 1050m, Jan., 1991 (QM); 2♀, Mt Misery, SW of Cooktown, Jan., 1994, G. and A. Daniels and R. Eastwood (GDCB); 1♀, Windsor Tableland via Carbine, Jan., I. Fanning (QM); 1♀, Mt Lewis Rd., 29 km from highway, 1210m, Nov., 1998, C.J. Burwell (QM); 3♀, 1 km N of Julatten, Nov., 1998, C.J. Burwell (QM); 2♀ Julat-

ten, nr Mt Molloy, Oct., 1979, M.S. and B.J. Moulds (GDCB), Jan., G & A. Daniels (GDCB); Springbrook, Nov., 2000, G.R. Forbes (GDCB). **NSW:** 1 ♀ Brunswick Heads, Mar., 1991, R. Eastwood (GDCB).

Diagnosis. A medium to large sized 14–16 mm dark brown to blackish species representing a smaller coastal form near *C. wentworthi* and *C. victoriensis*, extending from Cape York in north Queensland to Brunswick Heads in northern New South Wales. Distinguished from all other species by combination of four morphological features; green eyes (relaxed), uniformly clouded greyish brown wings without suffusion along veins so much as in cells and with clear window in basal portion of cell R_1 extending apically to basal edge of stigma, more acute dorsal angle on basal plate with prominent tooth often directed anteriorly and all black hairs on both palpal segments. Further distinguished from *C. wentworthi* by much narrower frons, pyriform rather than quadrate callus although both with tapering extensions almost to ocellar tubercle, ash to slate grey rather than brown palps, scutum without traces of darker median and dorsocentral lines, wings very similar and both with clear window in basal portion of cell R_1 but with suffusion more within cells than along vein margins, with a coastal rather than montane habitus. Further distinguished from *C. victoriensis* by smaller size, callus not quadrate but with gently sloping shoulders; less concolourous appearance, with narrow pale apical margins and median triangles both covered with fine white hairs on abdominal tergites and from *C. pruina* by greater length of extension on callus, callus almost full width of frons at base, and absence of darker median and lateral vittae on scutum,

Female. Head. Eyes (relaxed) green, hairs not visible at 15x. Frons narrow, parallel to slightly divergent, index 6.6–6.8, with dark grey tomentum and short black hairs; vertex depressed, vertical triangle dark grey; ocellar tubercle inconspicuous in several specimen, well defined in most, raised, dark greyish black, one or more ocelli sometimes visible; callus raised, shiny, chocolate brown, not quadrate but with sloping shoulders (= pyriform) and tapering extension reaching almost to ocellar tubercle, almost full width of frons at base. Subcallus smooth, with grey tomentum in anterior portion, yellowish fawn in antennal pits, without hairs; parafacials and face with fawn grey tomentum with short black hairs; beard dull white. Antennal scape twice as long as wide with dark grey tomentum and long black hairs, without dorsal prolongation; pedicel similar, with moderate dorsal prolongation; basal plate brownish black with acute basal dorsal angle forming short sharp upward and often anteriorly directed tooth, ventral surface with gentle apical swelling; style black, slender, longer than basal plate. Palpi ash to slate grey with all black hairs on both palpal segments.

Thorax. Scutum and scutellum blackish, without traces of darker median and dorsocentral lines, scutum lighter brownish on lateral margins with short scanty appressed grey hairs. Pleura pale grey with grey hairs.

Legs. Femora and tarsi black with black hairs; tibiae brown with predominantly black hairs.

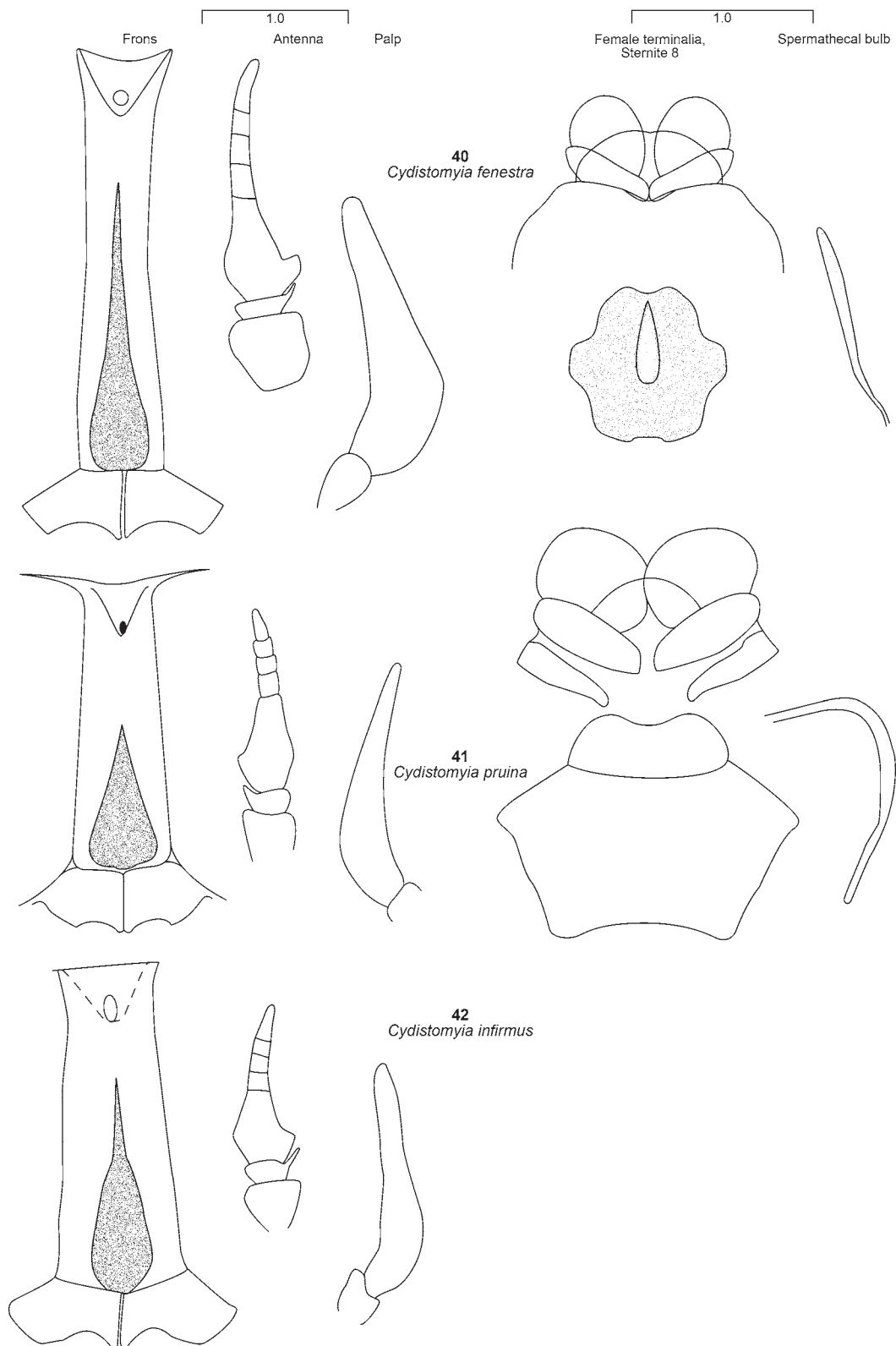
Wings. Almost uniformly clouded greyish brown in cells of basal two-thirds and with clear window in basal portion of cell R_1 extending apically to basal edge of stigma, with very little suffusion along veins and no discrete brown cloud in apical half. Costal cell entirely brown. (Wing markings more similar to *wentworthi* than to *doddi*, *magnetica* and *alternata*).

Abdomen. Highly variable, general appearance from mixed brown and black to slate grey to black, with narrow pale margins to apices of some or all tergites and creamy white hairs over these, with pale median triangles covered with white hairs on tergites 2–5 or not at all; with smaller patch on tergite 1 or absent; with lateral patches of white hairs apically on tergites 1–4. Venter dark brown to almost black, often paler brown on 1st sternite; with narrow apical margins and lateral patches both with fine white hairs on sternites 1–5.

Male. With paler abdomen, tergite 2 with black median vitta and large pale brown lateral areas, tergite 3 with broader dark median vitta and narrower brown lateral areas, remaining tergites black with narrow pale margins to apices of all tergites and creamy white hairs over these, with pale median triangles covered with white hairs on tergites 2–5 and smaller patch on 1st tergite; with lateral patches of white hairs apically on tergites 1–4. Venter similar to female.

Distribution. NE and SE QLD, and NE NSW.

Etymology. The specific epithet refers to the Latin for window and derives from the characteristic clear window in the basal section of cell R_1 extending apically to the basal portion of the stigma in the wings of this species.



FIGURES 40–42. 40. *Cydistomyia fenestra* Mackerras & Spratt, **sp. nov.** frons, antenna, palp, female terminalia, sternite 8, spermathecal bulb. 41. *Cydistomyia pruina* Mackerras & Spratt, **sp. nov.** frons, antenna, palp, female terminalia, sternite 8, spermathecal bulb. 42. *Cydistomyia infirmus* Mackerras & Spratt, **sp. nov.** frons, antenna, palp.

***Cydistomyia pruina* Mackerras & Spratt, sp. nov.**

(Fig. 41)

Type material. Holotype female, NSW, Alpine Creek, Kiandra, Jan. 1935, T.G. Campbell (ANIC). Paratype females (6), same data as for holotype (ANIC).

Non-type material examined. **ACT:** 1♀ Bendora, 9.ii.1948, 1♀ 13.ii.1950, S.J. Paramonov (ANIC). **NSW:** 1♀ Mt Gingera, 17.ii.1965, A.L. Dyce and M.D. Murray (ANIC); 1♀ Wee Jasper, 914 m, 29.i.1933, M. Fuller (ANIC); 2♀ Alpine Ck, Kiandra, 30.i.1964, T.G. Campbell (ANIC), 1♀ 1.i.1963, J. Bancroft and I.M. Mackerras (ANIC), 1♀ 16.i.1935, S.J. Paramonov (ANIC); 1♀ 13 km SE Talbingo, 30.i.1964, T.G. Campbell (ANIC); 2♀ Brindabella to Rules Point, 30.i.1964, G. Wellings (ANIC); 3♀ 5 km NW of Rules Point, 30.i.1964, T.G. Campbell (ANIC); 1♀ Tintpot Clearing, Rules Point, 18.ii.1965, A.L. Dyce and M.D. Murray (ANIC); ♀ Lake Blowering, 14.ii.1977, H. McKenzie (AM); 2♀ Snowy Plains, 1219 m, biting, 11.ii.1978, 2♀ 17-18.ii.1975, D.M. Spratt (ANIC), 1♀ 28.ii.1980, P. Haycock (ANIC); 1♀ Thredbo R, 25.ii.1990, A.L. Dyce (ANIC); 1♀ Mt Kosciuszko, 1219 m, 29.i.1933, 1♀ 27.i.1963, I.M. Mackerras (ANIC), 2♀ 1524 m, 11.ii.1924, A.J. Nicholson (ANIC); 2♀ Yellow Bog Creek, Kosciuszko Nat. Pk., 17.i.1978, G. Daniels (GDCB). **VIC:** 1♀ Bonang, SW of Delegate, i.1938, F.E. Wilson (ANIC); 1♀ Bogong, SE of Myrtleford, 23.i.1965, N. Dobrotworsky (ANIC).

Diagnosis. A medium-sized slatey grey species with conspicuous pale apical bands bearing line of creamy white hairs on abdominal tergites, pale grey wings without darkened costal cell and without brown suffusion along veins, and narrow basal plate with small gentle dorsal angle sometimes bearing small upwardly pointing tooth on antennal flagellum. This species represents the southern highland member of the *C. doddi*-*C. wentworthi* series and clearly links it with the large southern *C. victoriensis*. It is distinguished from *C. wentworthi* by clear wings, ill-defined ocellar tubercle, wider frons with differently shaped callus and extension which does not generally reach middle of frons, weak dorsal angle on basal plate, uniformly brown legs and characteristic abdominal markings. To be distinguished from *C. victoriensis* by smaller size, paler slate-grey colouration, clear wings, inconspicuous ocellar tubercle, generally wider frons with differently shaped callus, paler palps, paler antennal scape and pedicel, narrower basal plate with less pronounced dorsal angle, and characteristic abdominal markings. Length 13–17 mm.

Female. Head. Eyes (relaxed) black, with short fine sparse hairs just visible at 15X magnification. Frons medium, parallel to slightly divergent, index 3.5–4.5, with grey to greyish fawn tomentum and longish black hairs; vertex depressed; vertical triangle well defined, lighter grey than general tomentum, with short black hairs; ocellar tubercle poorly defined, when present somewhat elongate, depressed, brown; ocelli not visible; callus pyriform, raised, shiny, dark brown, about two-thirds width of frons at base, with tapering extension generally not reaching to middle of frons. Subcallus with fawn grey tomentum, no hairs; parafacials and face with similar but paler fawn tomentum, with numerous black hairs mixed with dull yellowish ones; beard dull greyish cream, with few black hairs. Antennal scape and pedicel brownish fawn, with black hairs; basal plate dark brownish black, narrow, with gentle dorsal angle, sometimes with short upward pointing dorsal tooth; style slightly darker. Palpi brownish fawn, narrow, with short mixed black and white hairs on segment 1, predominantly all black on segment 2.

Thorax. Scutum and scutellum dark grey, former with clear indications of darker median and lateral vitæ, lighter grey lateral margins; hairs mixed black, grey and greyish white, not appressed. Pleura brownish grey, hairs greyish white anteriorly, mixed with black hairs on mesopleural convexity, with prominent tuft of long creamy white hairs on hypopleural convexity.

Legs. Brown, darkening on tarsi; hairs on femora mixed greyish white and black, predominantly black elsewhere.

Wings. Greyish, costal cell not darkened; veins not suffused with brown along margins.

Abdomen. Slate-grey, with conspicuous pale apical bands bearing line of creamy to creamy white hairs on all tergites. Band usually expanding slightly to form small median triangles with creamy white hairs on tergites 2–5 and similar lateral triangles on tergites 2–4, elsewhere hairs black. Venter paler slate-grey, with similar pale apical bands on all sternites but not bearing creamy white hairs, hairs mixed black and greyish

white overall.

Distribution. Inland high country ACT, NSW and VIC.

Etymology. The specific epithet derives from the Latin for hoarfrost and refers to the characteristic abdominal pattern of this species which is suggestive of a coating of hoarfrost similar to that which occurs commonly at Alpine Ck, Kiandra.

***Cydistomyia infirmus* Mackerras & Spratt, sp. nov.**

(Fig. 42)

Type material. Holotype female, NSW, Mt Westmacott, nr Waterfalls, Dec., G. Daniels (AM).

Non-type material examined. **NSW:** 1 ♀ Bondo State Forest, 9.ii.1982, P. Haycock (ANIC). **VIC:** 1 ♀ Tennyson Ck 5 km NW Buldah, 10-15.i.1982, ANZSES Expedition (GDCB).

Diagnosis. A medium-size, 13–15 mm brown species like a brown *C. pruina* with inconspicuous median dark abdominal vitta, wide frons, tear-drop shaped callus with long narrow extension reaching two-thirds length of frons and about half the width of the frons at its base, with a black beard and brown antennal basal plate.

Female. Head. Eyes (relaxed) black, bare. Frons wide, slightly divergent, index 3.2, with fawn brown tomentum with dense long black hairs; vertex not hollow; vertical triangle inconspicuous; ocellar tubercle shiny, ocelli not visible; callus shiny, brown, tear-drop shaped with long narrow extension to two-thirds length of frons, about half width of frons at base. Subcallus with fawn tomentum, without hairs; parafacials and face with fawn tomentum with dense black hairs; beard predominantly black with scattered white hairs. Antennal scape and pedicel fawn grey with black hairs, pedicel with pronounced anterior prolongation almost reaching dorsal tooth; basal plate brown with gentle basal dorsal angle and small tooth, fine apical swelling ventrally; style dark brown. Palpi fawn with black hairs, longer in basal half, relatively slender.

Thorax. Scutum and scutellum grey, former pale brown laterally, both with short red brown hairs, longer on posterior margin of scutellum. Pleura fawn grey with predominantly long black hairs with some pale white ones.

Legs. All brown, femora with long black hairs and tibia and tarsi with short black hairs.

Wings. Clear, stigma inconspicuous.

Abdomen. Brown with indistinct median black vitta, narrow pale apical margins on all tergites, with fine white hairs on margins and small patches of white hairs laterally on tergites 1–4; elsewhere hairs black. Venter brown with some scattered black patches especially laterally; with narrow pale apical margins with fine white hairs on all sternites; elsewhere hairs black.

Distribution. S of Sydney, inland NSW and VIC.

Etymology. The specific epithet derives from the Latin for weak and refers to the indistinct dark median vitta on the abdomen of this species.

***Cydistomyia victoriensis* (Ricardo)**

(Figs. 7, 12, 43)

**Tabanus victoriensis* Ricardo, 1915a: 275; Froggatt 1915: 18; Ricardo 1917: 219; Taylor 1918: 64; Ferguson & Henry 1920: 842; Ferguson, 1920: 132, 1921a: 373; Surcouf 1921: 88; Hardy 1939: 42, 1944: 84; Chainey, 1990: 317.

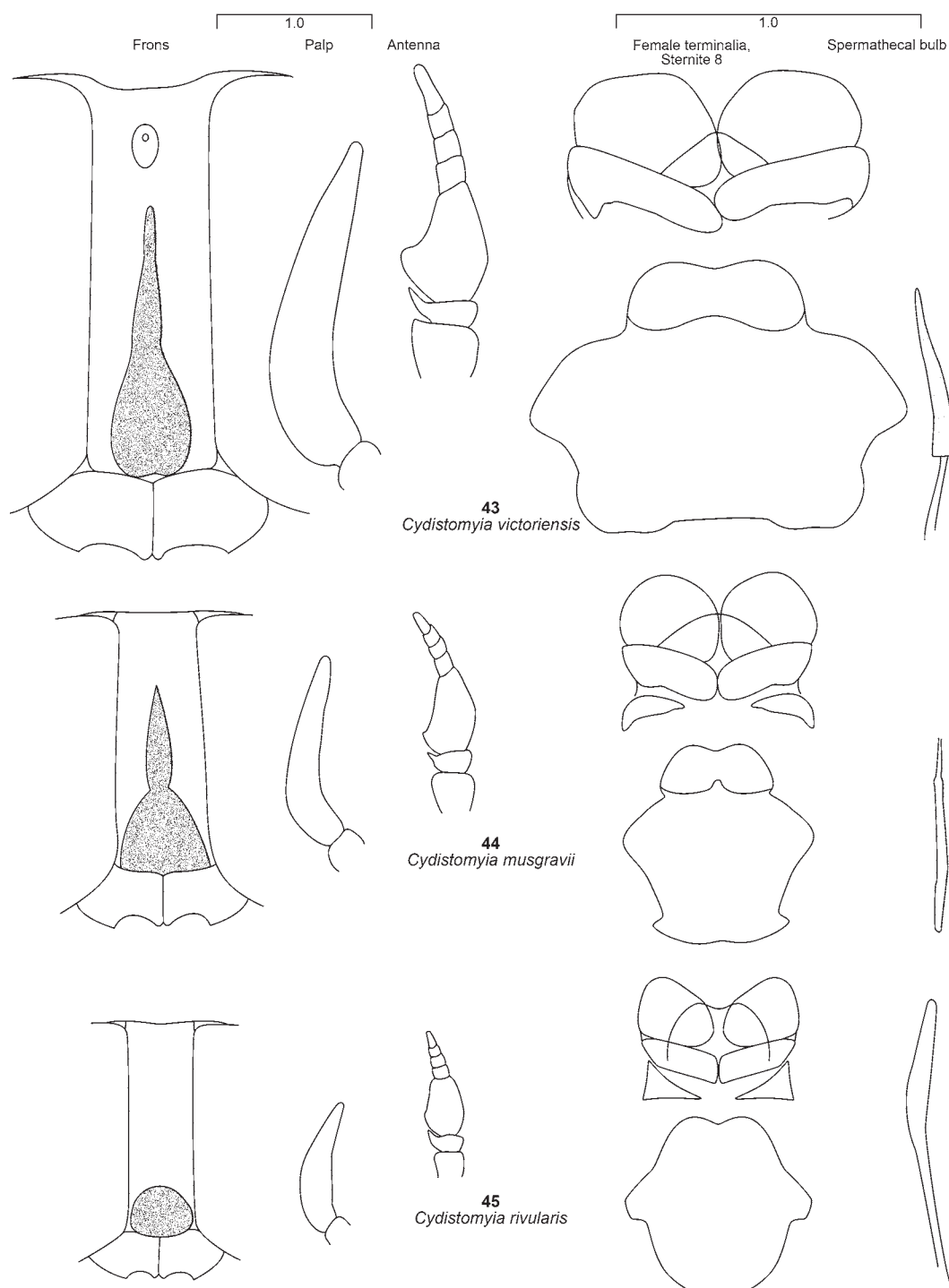
Holotype female, from Dandenong Ranges, Victoria (BMNH)

Cydistomyia victoriensis; Mackerras 1959: 168; Daniels, 1989: 288; Bickel & Elliot, 1998-2005: 5.

Other material examined. 208 ♀, 29 ♂.

Diagnosis. A large squarely built concolourous dark slate-grey species with costal and subcostal cells wholly

or partly suffused with brown, conspicuous brown suffusion along margins of wing veins, and narrow basal plate with acute dorsal angle forming short but sharp upward and often forwardly directed tooth. Distinguished from *wentworthi* by this feature of antennae, generally larger size, inconspicuous abdominal markings, shape of callus, and generally darker legs. Readily distinguished from *pruina* by brown suffusion on wings and additional features listed under that species. Length 16–21 mm (usually 18–21).



FIGURES 43–45. 43. *Cydistomyia victoriensis* (Ricardo) frons, palp, antenna, female terminalia, sternite 8, spermathecal bulb. 44. *Cydistomyia musgravii* (Taylor) frons, palp, antenna, female terminalia, sternite 8, spermathecal bulb. 45. *Cydistomyia rivularis* (Ferguson & Hill) frons, palp, antenna, female terminalia, sternite 8, spermathecal bulb.

Female. Head. Eyes (relaxed) blackish, with short fine rather sparse hairs just visible at 15X magnification. Frons medium, parallel or slightly divergent, index 4.0–5.4, with grey to greyish fawn tomentum and short dark hairs; vertex depressed; vertical triangle well defined, lighter grey than general tomentum; ocellar tubercle conspicuous, shiny, dully, irregular, with well defined anterior ocellar pit, ocelli occasionally observed; callus pyriform, raised, elongate, about two-thirds width of frons at base, tapering to narrow grooved extension which usually reaches to ocellar tubercle. Subcallus projecting, covered with grey tomentum at sides, dull yellowish cream in middle, usually with patch of short black hairs on each side above antennae; parafacials and face with rather dirty creamy grey tomentum and short dark hairs; beard dull greyish cream, with few black hairs. Antennal scape and pedicel with blackish brown tomentum, with black hairs, pedicel almost twice as long as wide, with pronounced dorsal prolongation; flagellum black, basal plate narrow, with acute dorsal angle forming short sharp upward and generally anteriorly directed tooth. Palpi greyish fawn, with numerous short black hairs.

Thorax. Scutum and scutellum dark grey, with faint indications of narrow median and dorsocentral lines and lighter grey lateral margins; hairs mixed black and inconspicuous greyish white. Pleura grey, with greyish white hairs anteriorly, posteriorly, and on posterior edge of mesopleural convexity, black on most of mesopleura, black tuft among white on posterior edge of convexity.

Legs. Dark grey to black, with black hairs; hind tibial fringe short but fairly dense.

Wings. Greyish brown, costal cell and area behind dark brown, stigma more brownish in hue, sometimes completely brown; veins with conspicuous brown suffusion along margins.

Abdomen. Uniformly dark slate-grey, with narrow inconspicuous paler margins to apices of tergites but without creamy white hairs over these, tergites with predominantly black hairs, with few scattered white ones. Venter with more conspicuous pale apical edges on sternites, with numerous white hairs among black ones, some white hairs on pale apical edges. In some specimens the lateral thirds of the tergites are dark brown, there are small median pale white-haired triangles on tergites 2–5 and the lateral margins of tergites 1–4 are pale and covered with dense greyish white hairs.

Male. Dimorphic. Differs from female in having blackish brown scutum and deep brown abdomen with medium black vitta. Pleura darker, black hairs more conspicuous. Eyes (relaxed) blackish, with short fine hairs visible at 15X magnification, contiguous, upper facets slightly enlarged but not sharply differentiated from lower ones. Ocellar tubercle small, broadly oval, prominent, projecting slightly above level of eyes. Palpi shorter, more acorn-shaped than in *wentworthi*, from which this species also differs in the entirely black hairs of the darker abdomen.

Distribution. Inland SE QLD, ACT and coastal and inland NSW and VIC. **QLD:** Montville, Deane; Mt Mistake, nr Laidley, Jan., D.M. Spratt; Lower Beechmont, Jan., G.J. and A. Holloway; Mt Nebo, Dec., E.H. Derrick; Mt Tamborine, Nov., H. Hacker, Dec., May, J.W. Davidson; Palen Ck SF, nr Rathdowney, Jan., A.J. Nicholson; McPherson Ra., 914 m, Dec.; Surprise Rock; Binna Burra, Nov., I.M. and M.J. Mackerras; Springbrook, Nov., D.S. Kettle, Dec., I.M. and M.J. Mackerras, D.B. Jones, Feb., A.C. Arvier; Lamington Nat. Pk., Jan., A.J. Nicholson, Dec.–Jan., H.J. Carter. **NSW:** Cudgen, Tweed R., Nov.; Byron Bay, Nov., Marr; 8 km W of Rosebank, Nov., M.S. Upton; Eltham, Dec., C.E. Chadwick, Lismore, in cowbails, Wardle; Gibraltar Range Nat. Pk., Dec., I.F.B. Common and E.D. Edwards; Dorrig, Jan., T. Wright; Boambee, Nov., C.R. Wallace; Kendall, Dec.–Jan.; Tuggolo, Feb., G. Edwards; Hampton, Jan., J. Andrews; Leura, Dec., D.H. Colless, Jan., W.W. Froggatt; Jenolan Caves, 609 m, J.C. Wibord; Kanangra Walls, Jan., J. Bishop; Blue Mtns, Jan., C. Deuquet; Robertson, Mar., C. Deuquet; Barren Grounds Nat. Res., Jan., Key, Feb., C.E. Chadwick; Fitzroy Falls, Nov., A.L. Tonnoir; Nowra, Jan., C. Deuquet; Wee Jasper, 914 m, Jan., M.E. Fuller; Blundell's, A.C.T., Dec.–Jan., M.E. Fuller, I.M. Mackerras, G.R.W. de Silva, S.J. Paramonov; Bendora, A.C.T., Jan., Grace, Feb., S.J. Paramonov, Z. Liepa; Uriarra, A.C.T., Jan., D.H. Colless; Mt Franklin, Jan., S.J. Paramonov; Mt Gingera, A.C.T., 176 m, Nov., S.J. Paramonov, Jan.–Feb., K.R. Norris, T.G. Campbell, I.F.B. Common, Key, A.L. Dyce and M.D. Murray; Brindabella Ra., Mar., T.G. Campbell and H. Davies; Tantangara Reservoir, Jan., P. Hay-

cock; Yarrangobilly, Jan., M.E. Fuller, T.G. Campbell, G. Wellings; Rules Point, Jan., T.G. Campbell; Alpine Ck, Kiandra, Nov., A.L. Tonnoir, Jan., M.E. Fuller, T.G. Campbell, J. Bancroft and I.M. Mackerras; Snowy Plains, 1219 m, Jan.–Feb., D.M. Spratt; Geehi, 457 m, Jan., M.F. Day; Mt Kosciuszko, 1524 m, Jan., Tillyard, M.E. Fuller, Feb., A.J. Nicholson, F.H. Taylor; Nadgee Nat. Res., Jan., M. Burt. **VIC**: Harrietville, Jan., K.L. Taylor; Mt Hotham~ Jan., F.E. Wilson; Treasure's, 1402 m, Feb., N. Dobrotworsky; Jamieson, Jan., N. Dobrotworsky; Cann R., Jan., N. Dobrotworsky; Fernshaw, Jan., A.L. Dyce; Mt Donna Buang via Healesville, Jan., T. Weir; Warburton District; Noojee, Jan., F.E. Wilson, N. Dobrotworsky; Cockatoo, Jan., A.L. Dyce; Neerim, Jan., F.E. Wilson; Mulgrave, Feb., F.E. Wilson; Yarram, biting, Feb.–Mar., G.W. Douglas; Wilson's Promontory, Kershaw, Jan., A.J. Nicholson, G. Thomson; Maroona, Feb.–Mar., N. Dobrotworsky.

Cydistomyia musgravii (Taylor)

(Fig. 44)

**Tabanus musgravii* Taylor, 1918: 64; Ferguson 1920: 132. Holotype female, from Underbank, NSW (AM).

Cydistomyia musgravii; Mackerras, 1959: 168; Daniels, 1989: 287; Bickel & Elliot, 1998–2005: 4.

Other material examined. 103 ♀, 9 ♂.

Diagnosis. A small to medium-sized, 10–12 mm, blackish species with narrow but well-defined pale apical bands and median spots on abdominal tergites, generally recognisable by presence of well-developed, shiny ocellar tubercle frequently with clearly visible ocelli; remarkable in having narrow oblique green band across eye of female, as occurs also in *C. rivularis* and *C. atmophora*. Distinguished from *C. rivularis* by plain grey abdominal venter without median broad dark vitta, and from *C. atmophora* by much general paler colouration and absence of dark shiny distinctly banded abdominal venter and predominantly pale 2nd sternite. *C. musgravii* is distinguished from *C. innubilis* by banded eyes, darkish brown rather than greyish black abdominal colouration, particularly on the venter, wider frons with callus full width of frons at base, conspicuous ocellar tubercle, shorter fawn-brown rather than greyish black palps, brown legs, less conspicuous stigma and more rounded rather than sharply angulate vein R₄.

Cydistomyia musgravii is widely distributed, predominantly in mountain forest country.

Female. Head. Eyes in life reddish brown, with narrow bright green or blue-green oblique band at level of callus, bare (fine hairs visible at 35X magnification). Frons medium, parallel, index 3.0–3.8, with variegated grey and fawn tomentum, pale grey along eye margins, with scattered relatively long black hairs; vertex not hollow; vertical triangle greyish; ocellar tubercle raised, shiny, brown, oval or irregularly triangular, nearly always with well-defined anterior ocellus and frequently with other two ocelli developed as well; callus shiny, black, bulging, nearly full width of frons at base, pyriform, usually tapering evenly into extension which reaches one-half to two-thirds length of frons (not arising abruptly from rounded callus). Subcallus smooth, with ashy grey tomentum, yellowish above antennae, without hairs; parafacials and face with ashy grey tomentum and black hairs; beard greyish white. Antennal scape about as wide as long, pale greyish fawn, hairs black; pedicel cup-shaped, with short dorsal prolongation, slightly darker than scape, with black hairs; basal plate brown, with gentle ventral bulge anteriorly, moderately sharp dorsal angle posteriorly; style blackish brown. Palpi pale creamy fawn, with black hairs overall.

Thorax. Scutum dark brown with olive hue, rather wide greyish dorsocentral vittae and lateral margins, interrupted by brown stripe above wing root; paler colours not contrasting strongly with ground colour; hairs black and appressed yellowish cream, latter conspicuous only in front of scutellum. Scutellum dark olive-brown, greyish on margin; hairs as on scutum. Pleura pale grey, with relatively dense greyish white hairs, except for usual mixture of dark ones on upper mesopleural convexity.

Legs. Dark brown, femora with some greyish overlay, tarsi darkening to blackish brown; hairs greyish white on most of femora, black on anterior surface of fore femora, preponderantly black on tibiae, entirely

black on tarsi.

Wings. Distinctly greyish, costal cell not darkened; stigma brown, fairly conspicuous; veins dark brown; sc with a few scattered setulae above, normal row below.

Abdomen. Brownish black with black hairs, basal tergites not as dark as apical ones; narrow well defined pale grey, creamy haired apical band on tergites 1–6, widening to form small but definite median triangle on 2nd tergite, widening slightly on others; extreme lateral margins pale, with black hairs basally and creamy white hairs at apical lateral corners on all tergites. Venter grey, contrasting with dark dorsum, sternites with narrow pale cream apical margins, hairs creamy white on apical edges and laterally.

Male. More brownish and more hairy than female. Eyes barely hairy (short fine hairs just visible at 15X magnification), meeting over most of length of frons, upper facets distinctly enlarged, brighter reddish brown than dark small lower and posterior ones, narrow band of yellowish brown facets separating the two areas. Ocellar tubercle small, distinct, sunken somewhat below level of eyes; ocelli not detected. Palpi subcylindrical, tapering, bluntly rounded apically, yellowish cream with mixed black and greyish white hairs.

Distribution. Mountain forest country from N QLD through ACT and NSW to Gippsland VIC. **QLD:** Ching Do, F.H. Taylor; Stanley R., Woodford, Mar., I.M. Mackerras; Point Lookout, Stradbroke Is., Oct., G. Daniels; Mt Mistake, nr Laidley, Jan., D.M. Spratt; Moggill, Feb., D.S. Kettle, biting; Binna Burra, biting, Dec., I.M. and M.J. Mackerras; Springbrook, Jan., H. Hacker; Bald Mt via Emu Vale, Jan., R. Coles; Mt Lamington, Dec., H. Womersley; Lamington Plateau, Jan.; Lamington Nat. Pk., H.J. Carter, Dec., H. Hacker, Feb., H.G. Greening; Bald Mt via Tannymorel, Dec., R. Eastwood; Numinbah Valley, Mar., I.M. and M.J. Mackerras; Queen Mary Falls Nat. Pk., Mar., J. Bancroft and I.M. Mackerras. **ACT:** Cotter R, nr Canberra, Jan., G. Schipp; **NSW:** Acacia Plateau via Legume, Jan., B. Cantrell; Boonoo SF, nr Tenterfield, Dec., 950m, Jan 1000M\m, G. and A. Daniels; Ben Lomond, Mar., D.F. Waterhouse; Meldrum, Dec., Raven; Dorrigo, Jan.–Feb., T. Wright; scrub, nr Ebor, biting, Jan., I.M. and M.J. Mackerras; Point Lookout, nr Ebor, biting, Jan., I.M. and M.J. Mackerras; Barrington area, Gummi Plains, Mar., B. McMillan; Barrington Tops, Dec., G.M. Goldfinch, Jan.–Feb., S.U. Zool. Exp.; Eccleston, Mar.; Upper Allyn R., 457 m, Feb., I.F.B. Common and M.S. Upton; Blue Mtns, Mar.; Govett's Ck, Jan., B. McMillan; Mt Irvine, F.H. Taylor; Mt Victoria, Jan., M. Ekenberg; Blackheath, Feb., I.M. Mackerras; Jenolan Caves, 609 m, J.C. Wibord; Cordeaux, R., Feb., W.W. Froggatt; Colo Vale, Jan., W.W. Wirth, D.J. Lee, Feb., A.L. Dyce, B. McMillan, Mar., J. Citowitsch; 12 km SE of Crookwell, Jan., Carne, Helman and Greaves, Minnamurra Falls, Feb., C.E. Chadwick; Mt Coree, 914 m, 1219 m, A.C.T., Jan., I.F.B. Common; Bago Forest, Batlow, Mar., T.G. Campbell; Tinderry, bred from larva, Dec.; Snowy Plains, 1219 m, Feb. D.M. Spratt. **VIC:** Mansfield, Feb., G. Phillip; Mt Buangor, 427 m, 21 km NE of Beaufort, Feb., I.F.B. Common; Mt Disappointment, Feb., N. Dobrotworsky; Lyonville, Feb., N. Dobrotworsky; Lake Curlip, Gippsland, Feb., N. Dobrotworsky.

Remarks. One specimen is difficult to place. A small (9.5 mm) female from Kimberley Research Station, Ord R., WA, has a greyer abdomen with particularly pale 2nd and 3rd tergites, abdominal venter uniformly dark grey with narrow pale apical bands on each sternite, a narrower frons with shiny brown bulging and more oblong callus with short indistinct extension, broad basal plate without ventral bulge but with substantial dorsal angle, and dark fawn palps with a few mixed white and black hairs. This may represent a western form of *C. musgravii*.

***Cydistomyia rivularis* (Ferguson & Hill)** (Figs. 8, 45)

**Tabanus pygmaeus* Ferguson & Henry, 1920: 842 [Preoccupied by Williston, 1887], Nearctic; Mackerras, 1959: 168 (syn. of *rivularis* Ferguson & Hill). Holotype female, from Kendall, NSW (AM).

Tabanus rivularis Ferguson & Hill, 1922: 264 (replacement name for *pygmaeus* Ferguson & Henry, 1920).

Cydistomyia rivularis Mackerras 1959: 168; Daniels, 1989: 287; Bickel & Elliot, 1998-2005: 4.

Diagnosis. More variable in size (length 9–12 mm) than *C. musgravii* and *C. atmophora*, *C. rivularis* is distinguished from them by the presence of a broad dark median vitta on the abdominal sternites. Further distinguished from these species by wider frequently divergent frons (index 3.0–3.6) with numerous black hairs, indistinct vertical triangle, indistinct ocellar tubercle, smaller and usually more rounded callus with or without delicate narrow extension reaching to mid frons, fleshy white to light fawn palps with white hairs sometimes mixed with few black ones apically, light fawn scape and pedicel (latter slightly darker) with few short black hairs only apically and usually dorsally, narrower basal plate without ventral swelling and with gently rounded dorsal angle, and continuous row of setulae on vein sc above. It is distinguished from *C. innubilis* by banded eyes, darkish brown rather than greyish black abdominal colouration, particularly on the venter, wider frons with callus full width of frons at base, shorter fawn-brown rather than greyish black palps, brown legs, less conspicuous stigma and more rounded rather than sharply angulate vein R₄.

Cydistomyia rivularis is also widely distributed but almost invariably associated with rivers and streams in mountains and at low altitudes.

Female. Head. Eyes in life reddish brown, with narrow bright green or blue-green oblique band at level of callus, bare (fine hairs visible at 35X magnification). Frons frequently divergent, index 3.0–3.6, with variegated grey and fawn tomentum, pale grey along eye margins, with numerous short black hairs; vertex not hollow; vertical triangle indistinct; ocellar tubercle indistinct, ocelli not observed; callus shiny, dark brown, bulging, full width of frons at base, more rounded than pyriform, with or without delicate narrow extension arising abruptly and reaching to mid frons. Subcallus smooth, with ashy grey tomentum, without hairs; parafacials and face with ashy grey tomentum and black hairs; beard greyish white. Antennal scape about as wide as long, pale greyish fawn, hairs black; pedicel cup-shaped, with short dorsal prolongation, slightly darker than scape, with black hairs; basal plate brown, without ventral bulge anteriorly and with gently rounded dorsal angle posteriorly; style blackish brown. Palpi pale creamy fawn, with few black hairs.

Thorax. Scutum greyish black with vague, wide, greyish dorsocentral vittae and lateral margins, interrupted by brown stripe above wing root; hairs black and appressed yellowish cream, latter conspicuous only in front of scutellum. Scutellum greyish black, hairs as on scutum. Pleura pale grey, with relatively dense greyish white hairs except for usual mixture of dark ones on upper mesopleural convexity.

Legs. Brown, femora with some greyish overlay, tarsi darkening to blackish brown; hairs greyish white on most of femora, black on anterior surface of fore femora, predominantly black on tibiae, entirely black on tarsi.

Wings. Pale greyish, costal cell not darkened; stigma pale brown, inconspicuous; veins brown; with continuous row of setulae on vein sc above.

Abdomen. Brownish black with black hairs, basal tergites not as dark as apical ones; narrow well-defined pale grey, creamy haired apical bands on tergites 1–5, not widening to form definite median triangles; extreme lateral margins pale, with black hairs basally and creamy white hairs at apical lateral corners on all tergites. Venter grey laterally, contrasting with dark dorsum, with broad dark median vitta on sternites, usually extending from sternites 2–7, in some larger specimens extending only from sternites 2–5, with 6th and 7th sternites uniformly dark.

Male. Generally smaller than *C. musgravii* and distinguished from it by same features distinguishing females. Broad median dark vitta extending from sternites 2–6 on abdominal venter, 7th sternite uniformly black, with long black hairs. Sparse white hairs on sternites 2–5, short black hairs on 6th sternite. Legs more lightly coloured, fawn-brown, with darker tarsi. Antennae more lightly coloured, scape light fawn with white hairs, especially distally; pedicel light fawn with sparse long white hairs apically mixed with few black hairs apically and dorsally; basal plate narrow, pale orange-brown, with gently curving dorsal angle; stigma darker. Palpi fawn with numerous long white hairs and few short black ones. Vein sc with continuous row of setulae

above.

Distribution. Mountain and coastal rivers and streams from N of Emerald QLD through NSW to Warburton VIC. **QLD:** Valencia, Nov. J.E. Le Souef; Carnarvon Nat. Pk., Nov., D. Bickel, Dec., M.A. Schneider and G. Daniels; Stanley R., Woodford, Mar., I.M. Mackerras; 7 km S of Dayboro, Sept., M. Yall; Camp Mt, Nov., I.M. and M.J. Mackerras; Upper Coomera R., Dec., I.M. and M.J. Mackerras; Nerang R., nr Springbrook Forest, Dec., T.G. Campbell; Tallebudgera Ck, 15 km SSW of Burleigh Heads, Oct., D.J. Cook. **NSW:** Undercliffe Falls, Jan., F.A. Perkins; Browns Ck, Warrumbungle Nat. Pk., Jan., M.E. Irwin and D.K. Yeates; Wambelong Ck, Gumin, Jan., M.E. Irwin and D.K. Yeates; Murray R., nr Dorriggo, Jan., J.B. Cleland; Kew, Jan.; Chichester SF via Dungog, Dec., B. Cantrell; Kundibakh, C. Dennes; Eccleston, Feb.–Mar., J. Hopson; Allyn R., Dec., G.M. Goldfinch; Blackheath, Feb., A.J. Nicholson; Tuglow R., nr Mt Werong, Dec., G. Daniels; Cox's R., Dec., B. McMillan; Shoalhaven R., nr Tallong, Dec., B. McMillan; Wee Jasper, Jan., M.E. Fuller; Gibraltar Peak, Feb., S.J. Paramonov; Cotter R., Jan., M.E. Fuller, Jeffries, H. Wilson, Cabbage Tree Ck, Clyde Mtn, Jan., D.H. Colless; Queanbeyan R., nr Jerangle, Jan., I.M. Mackerras; Snowy Plains, Feb., D.M. Spratt; Kosciuszko Nat. Pk., Jan., M.J.D. White; Wallagoot Lake, nr Bega; Nadgee Nat. Res., nr Eden, Feb., D. Bickel. **VIC:** Bright, bred from larva, Dec., R. Lewis; Jamieson, Jan., N. Dobrotworsky; Warburton, Feb., N. Dobrotworsky.

Remarks. A female from Landsborough, Qld, has a brown abdominal venter with singularly indistinct median vitta, and possesses some black hairs both on the antennal scape and pedicel and on the palps and is difficult to place with certainty. In all other characters it agrees with *C. rivularis* so is tentatively placed here.

Cydistomyia atmophora (Taylor)

(Fig. 46)

**Tabanus atmophorus* Taylor, 1919: 59, 1926: 194. Type female, from Kuranda, north Qld, F.P. Dodd (ANIC).

Cydistomyia atmophora; Mackerras 1959: 168; Daniels, 1989: 286; Bickel & Elliot, 1998–2005: 2.

Other material examined. 22 ♀.

Diagnosis. A medium-sized species (length 10–12 mm) distinguished from *C. musgravii* and *C. rivularis* by much darker blackish brown legs; darker antennal scape and pedicel; darker palps; dark shiny distinctly banded abdominal venter, with 3rd and subsequent sternites generally black and with black hairs basally and yellowish cream to ashy white hairs apically; and predominantly pale 2nd sternite, somewhat darkened in centre. Frons narrow, index 3.4–3.9, like *C. musgravii*, but callus more oblong with irregular but fairly wide tapering extension to above middle of frons; ocellar tubercle flat, shiny, ocelli not detectable. Vein sc with continuous row of setulae above. *C. atmophora* is similar to *innubilis* in colouration, presence of conspicuous ocellar tubercle and a sharply angulate vein R_4 . It is distinguished from *C. innubilis* by banded eyes, shape of callus, narrower frons and narrower basal plate on antennal flagellum.

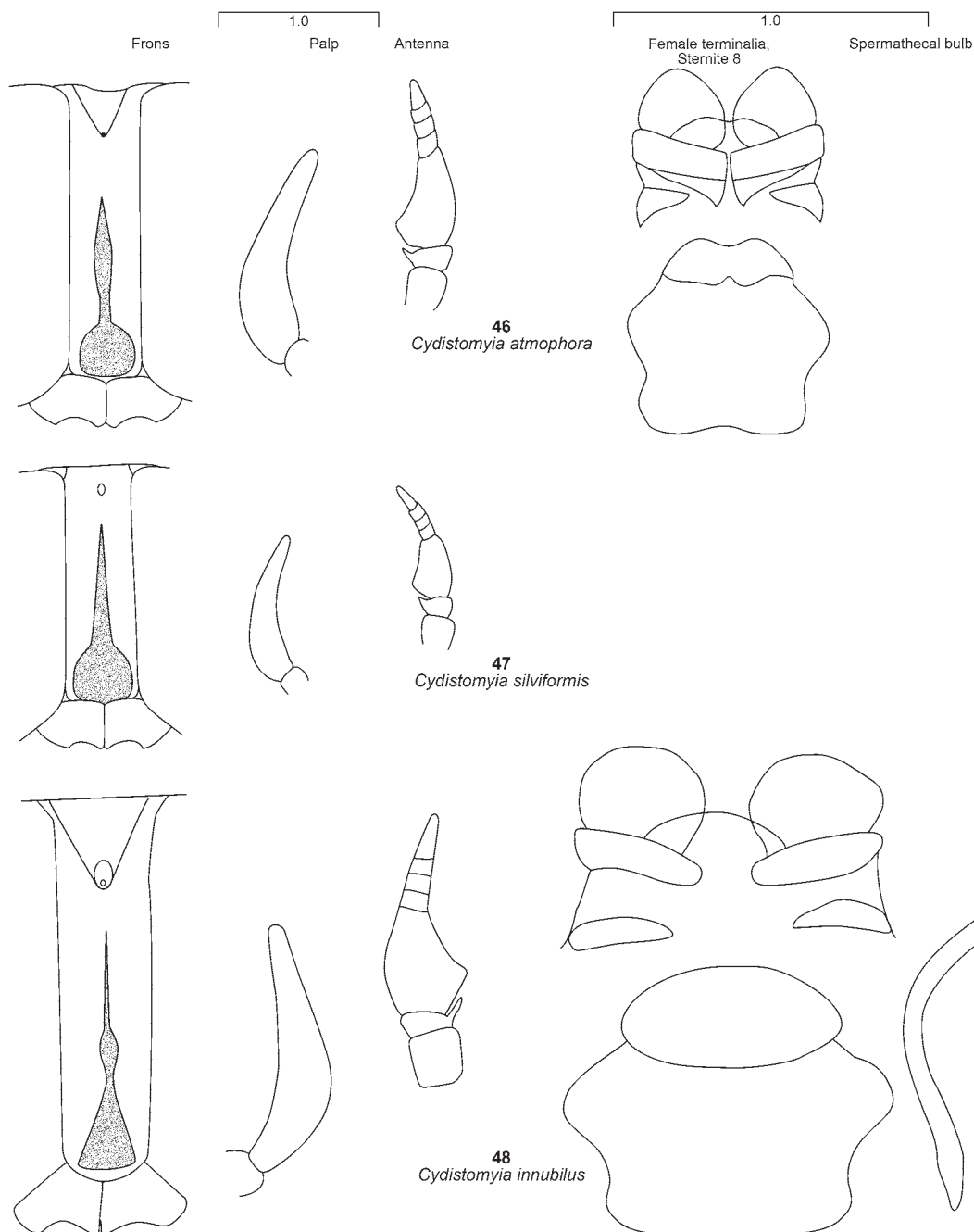
Cydistomyia atmophora is known only from northern Queensland.

Female. Head. Eyes in life reddish brown, with narrow bright green or blue-green oblique band at level of callus, bare (fine hairs visible at 35X magnification). Frons narrow, index 3.4–3.9, with variegated grey and fawn tomentum, pale grey along eye margins, with scattered relatively long black hairs; vertex not hollow, vertical triangle greyish; ocellar tubercle flat, shiny, ocelli not detectable; callus shiny, black, bulging, full width of frons at base, more oblong than pyriform or rounded, with irregular but fairly wide tapering extension to above middle of frons. Subcallus smooth with ashy grey tomentum, without hairs; parafacials and face with ashy grey tomentum and few black hairs; beard greyish white. Antennal scape about as wide as long, dark grey with dense long black hairs, pedicel cup-shaped, dark grey with dense long black hairs, with short dorsal prolongation, basal plate brown, without ventral bulge and with minute dorsal angle posteriorly, contrasting with dark brownish black style. Palpi dark grey with dense black hairs.

Thorax. Scutum greyish black, with indistinct greyish dorsocentral vittae and paler lateral margins, interrupted by short brown stripe above wing root; hairs black and yellowish cream, latter particularly conspicuous in front of scutellum. Scutellum greyish black; hairs as on scutum. Pleura pale grey, with relatively dense greyish white hairs, except for mixture of dark ones on upper mesopleural convexity.

Legs. Blackish brown, femora grey with long white hairs, tibiae darkening to blackish brown with black hairs; tarsi black with black hairs.

Wings. Greyish, costal cell not darkened, stigma pale brown, fairly conspicuous, veins brown; vein sc with continuous row of setulae above.



FIGURES 46–48. 46. *Cydistomyia atmophora* (Taylor) frons, palp, antenna, female terminalia, sternite 8. 47. *Cydistomyia silviformis* (Taylor) frons, palp, antenna. 48. *Cydistomyia innubilis* Mackerras & Spratt, **sp. nov.** frons, palp, antenna, female terminalia, sternite 8, spermathecal bulb.

Abdomen. Black with black hairs; broad well-defined pale grey, creamy haired apical bands on tergites

2–6, not widening to form median triangles, barely discernible on 1st tergite; extreme lateral margins of tergites 1–4 paler, with creamy white hairs. Venter dark, shiny, distinctly banded, with 3rd and subsequent sternites generally black and with black hairs basally and yellowish cream to ashy white hairs apically, with 2nd sternite predominantly pale and somewhat darkened in centre.

Distribution. From Cape York Peninsula to S of Bundaberg QLD. **QLD:** Jardine R., Cape York Peninsula, Oct., M.S. and B.J. Moulds; Cockatoo Ck, 17 km NW of Heathlands High School, Cape York Peninsula, Mar., G. Daniels and M.A. Schneider; Gunshot Ck, 13 km NW of Heathlands HS, Mar., G. Daniels and M.A. Schneider; Heathlands High School, Mar., G. Daniels and M.A. Schneider; Bertie Ck, 1 km S of Heathlands HS, Mar., G. Daniels and M.A. Schneider; 1 km SE of Heathlands HS, Mar., G. Daniels and M.A. Schneider;; Lockhart R., Rev. Flint; Mackay, Feb.; Archer R. crossing, Apr., G. and A. Daniels; 20 km W of Fairview (W of Cooktown), Apr., G. and A. Daniels; Proserpine Airport, Feb., I.M. Mackerras; Keneffs Lookout, Mt. Moffat Section, Carnarvon Nat. Pk., Sept., D.K. Yeates.

Cydistomyia silviformis (Taylor)

(Fig. 47)

**Tabanus silviformis* Taylor, 1919, p. 62. Holotype female, from Stradbroke Island, south Qld (QM).

Cydistomyia silviformis; Mackerras, 1959: 168; Daniels, 1989: 288; Bickel & Elliot, 1998-2005: 4.

Other material examined. 2 ♀.

Diagnosis. A very small, slender, brown species, known only from the type series. Resembling a small *C. musgravii forma rivularis* from which it is distinguished by the brown colouration, narrower frons, brown shiny, callus not full width of frons at base and with uniformly tapering narrow extension reaching at least two-thirds length of frons, absence of dorsal prolongations on antennal scape and pedicel, and absence of dark median vitta on abdominal venter. To be distinguished from *C. palmensis* by smaller size, lighter colour, light fawn palpi, and light yellowish brown wing veins. Length 8 mm.

Female. Head. Eyes (relaxed) reddish brown, bare (few short hairs just visible at 35X magnification). Frons slightly divergent, index 4.3, covered with brown tomentum and hairs, light greyish fawn along eye margins; ocellar tubercle indefinite; callus brown, shiny, distinctly raised, about four-fifths width of frons at base, tapering to extension reaching two-thirds length of frons. Subcallus, parafacials, and face light greyish cream; subcallus not shiny, without hairs, parafacials and face with light brown hairs; beard creamy white. Antennal scape fawn, pedicel fawn to reddish brown, both with dark brown to blackish hairs; flagellum missing. Palpi relatively long, narrow (like in *C. musgravii* form and contrasting with fleshiness of *C. rivularis* form), light fawn, with dark brown to black hairs, some cream ones below.

Thorax. Scutum and scutellum brown, with indications of paler dorsocentral vittae and paler lateral margins, hairs brown, mixed with creamy gold, with some long dark brown ones laterally in front of wing root. Pleura pale greyish fawn, with white hairs, few brown ones on upper part of upper mesopleural convexity.

Legs. Bright brown, darkening on tarsi; hairs brown, creamy on mid and hind femora and basal half of fore tibiae laterally.

Wings. Faintly greyish, without brownish hue; veins light yellowish brown.

Abdomen. Brown, with brown hairs; apices of tergites with well-defined pale greyish fawn bands covered with creamy hairs, widening in mid line to form apical triangles on 2nd, 4th and 5th tergites and at extreme lateral edges of all tergites. Venter brown, with greyish overlay, with paler apical margins to sternites, no indication of median vitta, hairs predominantly cream, dark brown on 6th and 7th sternites.

Distribution. Known only from type locality, Stradbroke Island, QLD.

***Cydistomyia innubilis* Mackerras & Spratt, sp. nov.**

(Fig. 48)

Type material. Holotype female, NT, Koongarra, 15 km E of Mt Cahill, Mar. 1973, D.H. Colless (ANIC). Paratype male, same data as for holotype except Nov. 1972 (ANIC).

Non-type material examined. NT: 1♀ Holmes Jungle, 14 km NE of Darwin, Mar., 1965, Gressitt (ANIC); 1♀ 22 km WSW of Borroloola, Malaise trap, Apr., 1976, D.H. Colless (ANIC).

Diagnosis. A medium-sized greyish black species closely resembling *Dasybasis griseoannulata* (Taylor) but distinguished from it by wider frons, callus markedly narrower than frons at base and with broader extension, absence of appendix on R₄ and absence of brown suffusion on wings. Length 10–12 mm.

Female. Head. Eyes (relaxed) green with red brown reflections, wide, bare (short hairs just visible at 35X magnification). Frons long, moderately narrow, slightly divergent, index 3.7–4.1, with fawn tomentum, pale grey at sides, with short inconspicuous dark hairs over middle; vertex flat; vertical triangle grey, moderately well-defined, with short dark hairs; ocellar tubercle well defined, flat, anterior ocellar-spot clear, posterior ocelli not observed; callus dark brown, conspicuously narrower than frons at base, elongate, pyriform, tapering into moderately narrow extension which reaches one-half to two-thirds length of frons. Subcallus with pale creamy tomentum, with fawn tint above antennae, without hairs; parafacials and face pale grey, with short white hairs; beard white. Antennal scape dark brown with some greyish overlay, hairs black; pedicel with dorsal prolongation, dark brown, with short dark hairs distally; basal plate wide, orange-brown, with sharp dorsal angle bearing few short dark hairs; style darker orange-brown. Palpi grey-brown, with white hairs basally, short black ones on distal two-thirds.

Thorax. Scutum greyish brown, almost uniform over disc, somewhat paler on side margins; scutellum darker, hairs inconspicuous black and dull creamy white. Pleura pale grey, with creamy white hairs.

Legs. Dark, almost blackish brown, with dark brown hairs on all segments.

Wings. Clear to very pale greyish, without brown suffusion, costal cell not darker than others; stigma dark brown; veins brown.

Abdomen. First tergite greyish black, with barely discernible narrow greyish white apical margin, remainder blackish brown with black hairs, with narrow pale grey apical margins covered with creamy white hairs, appearing banded. Venter similar, with narrow pale grey apical margins covered with creamy white hairs.

Male. Similar to female but with narrower pale apical bands on abdominal tergites and particularly on sternites. Eyes large, bare (scattered short hairs visible at 35X magnification), upper facets greatly enlarged, brighter reddish brown (not fawnish) contrasting with darker lower facets and narrow posterior margin. Antennae more slender than in female but with strong dorsal angle bearing few short black hairs. Palpi fusiform, tapering abruptly to point, cream coloured (not brown), with long white hairs and a few brown ones laterally and distally.

Distribution. From Darwin to Borroloola NT.

Etymology. The specific epithet drives from the Latin for cloudless and refers to the clear unclouded wings of this species.

***Cydistomyia brevior* (Walker)**

(Fig. 49)

**Tabanus brevior* Walker, 1848: 188; Froggatt 1911: 13, 1915: 14; Ricardo 1915a: 279; Taylor 1919: 57; Ferguson & Hill 1920: 465; Ferguson 1921a: 373; Surcouf 1921: 63; Hardy 1944: 84; Chainey, 1990: 251. Holotype female, from Port Essington, NT (BMNH).

Cydistomyia brevior; Mackerras, 1959: 169; Daniels, 1989: 286; Bickel & Elliot, 1998-2005: 3.

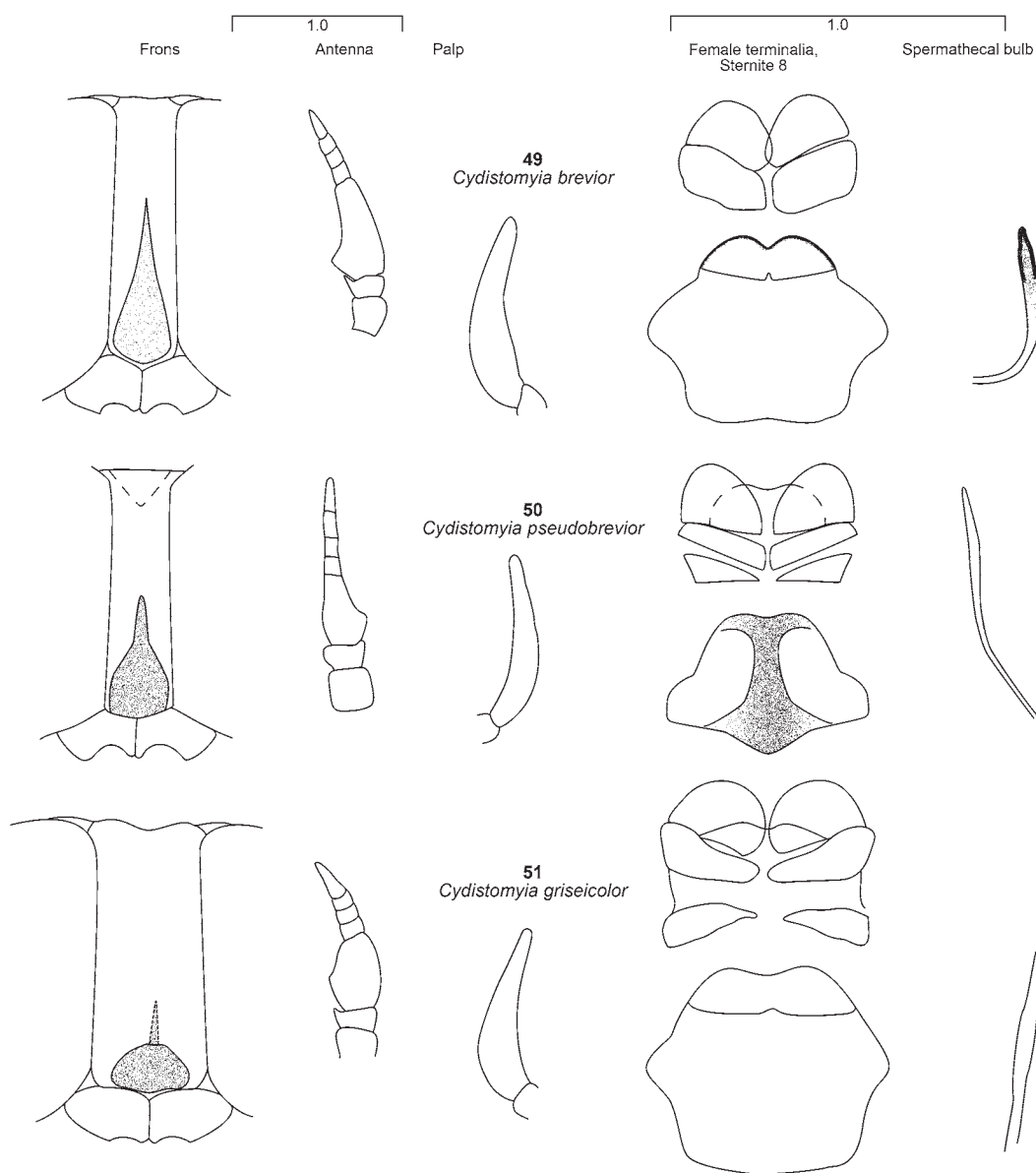
Tabanus marginatus var. β . Walker, 1848: 189; Ricardo 1915a: 279 (syn. of *brevior* Walker) (see Remarks); Hardy 1944: 84; Mackerras 1959: 169 (both as syn. of *brevior* Walker), Chainey, 1990: 285. Specimen from Port Essington, NT (BMNH). (The true **marginatus* Walker, 1848 is a *Mesomyia*).

**Tabanus anellosus* Summers, 1912: 226; Austen 1914: 266 (syn. of *brevior* Walker); Ricardo 1915a: 279; Ferguson & Hill, 1920: 465; Surcouf, 1921: 63; Mackerras 1959: 169. (all as syn. of *brevior* Walker); Chainey, 1990: 244. Syntypes, three females, from Darwin, NT, S.L. Strangman (BMNH).

**Tabanus australis* Taylor, 1917a: 757; Ferguson & Hill, 1920: 465 (syn. of *brevior* Walker); Mackerras, 1959: 169 (confirms synonymy). Holotype female, from Stapleton, NT (ANIC).

**Tabanus crypserythrus* Taylor, 1919: 60; Ferguson & Hill 1920: 465 (syn. of *brevior* Walker) Mackerras, 1959: 169 (confirms synonymy). Syntypes, male and female from near Darwin, NT (ANIC).

Other material examined. 34 ♀, 15 ♂.



FIGURES 49–51. 49. *Cydistomyia brevior* (Walker) frons, antenna, palp, female terminalia, sternite 8, spermathecal bulb. 50. *Cydistomyia pseudobrevior* Mackerras & Spratt, **sp. nov.** frons, antenna, palp, female terminalia, sternite 8, spermathecal bulb. 51. *Cydistomyia griseicolor* (Ferguson & Hill) frons, antenna, palp, female terminalia, sternite 8, spermathecal bulb.

Diagnosis. A small yellowish brown species, with pale apical bands on abdominal tergites, narrow frons, relatively elongate bell-shaped callus, preponderantly blackish femora, and with well-defined right angle on vein

R₄ but without appendix or with only rudimentary stump on one wing only. (One male has appendices on both wings). With the exception of the occasional brown forms of *C. musgravii* (which may be due only to age) this species should be readily distinguished from all other named species of *Cydistomyia* except *C. pseudobrevior* sp. nov. because of its small size and light brown, almost yellowish colouration. It is distinguished from *C. pseudobrevior* by the usually well-defined ocellar tubercle and occasional hints of one or two ocellar spots, tapering extension of callus generally reaching to a little above middle of frons, flat subcallus, presence of small dorsal prolongation on pedicel, absence of median triangles in midline on abdominal tergites 2–4. It is distinguished from *C. musgravii* by absence of narrow green band across eye of female, darker more blackish legs, narrower frons with differently shaped callus and narrower basal plate.

Cydistomyia brevior may be confused with three northern forms of *Dasybasis* Macquart. However, it is distinguished from *D. clavicullosa forma darwinensis* (Taylor), *D. constans* (Walker) and *D. germanica* (Ricardo) by the absence of an appendix on vein R₄ or its presence on one wing only and in the form of a rudimentary stump, presence of an ocellar tubercle, narrower frons, differently shaped callus which is almost full width of frons at base, and abdominal colouration. The legs of *D. clavicullosa forma darwinsensis* and *D. constans* are pale but those of *D. germanica* are frequently dark like *C. brevior*. Tergites and sternites 1–3 are not so contrasting in colouration in *brevior* as they are in *D. germanica*, although the remaining ones are similar. The enlarged upper facets of the eyes of male *brevior* are bare (hairs barely discernible at 35X magnification) while those of male *D. germanica* are hairy (easily seen at 15X magnification).

Female. Head. Eyes in life green, bare (few scattered hairs barely visible at 35X magnification). Frons relatively narrow, parallel or slightly divergent, index 4.2–4.4, with pale creamy fawn tomentum and short dark brown hairs; vertex not hollow; vertical triangle ill defined; ocellar tubercle usually well defined, slightly raised, brown, somewhat shiny; occasionally hints of one or more small ocellar spots; callus brown, slightly narrower than frons at base, bell-shaped, with narrow tapering extension to a little above middle of frons. Subcallus flat, smooth, with a greyish cream tomentum, without hairs; parafacials and face with greyish white tomentum and fawn-white hairs; beard white. Antennal scape subcylindrical, distinctly longer than wide, light yellowish cream, with short black hairs; pedicel about half as long as wide, with small dorsal prolongation, colour and hairs as on scape; basal plate bright brownish orange, with well-defined dorsal angle projecting as small knob, occasionally with few short black hairs at angle; style brownish black. Palpi moderately plump, pale yellowish cream, with creamy white and scattered short black hairs.

Thorax. Scutum and scutellum almost uniformly greyish, paler anteriorly and laterally, with short black and creamy white hairs. Pleura pale grey, with white hairs.

Legs. Femora dark to blackish brown, with variable amount of grey overlay, fore femora with dark brown hairs, mid and hind with creamy to whitish hairs; tibiae light brownish yellow basally, becoming brown towards apex, with dark brown hairs mixed with yellowish cream ones on paler parts; tarsi dark brown, with dark brown hairs. In some specimens almost the whole of the fore leg is dark brown.

Wings. Pale greyish to almost clear, costal cell sometimes faintly yellowish; stigma yellowish brown; veins light yellowish brown, darker apically and distally; cell R₄ wide; vein R₄ angulate, without appendix or at most with a rudimentary stump on one wing only.

Abdomen. First tergite yellowish fawn, 2nd and 3rd (sometimes 4th) light brown, remainder dark brown, all except 7th with broad light yellowish fawn apical bands; hairs black on darker parts, yellowish cream on paler areas and extending vaguely in mid line on tergites 2–5. Venter darker than dorsum, brownish grey, with conspicuous pale apical bands on sternites; hairs predominantly yellowish cream.

Male. Similar to female but scutum more greyish fawn and abdomen more brightly brownish yellow. Eyes large, bare (hairs just visible at 35X magnification), meeting on almost full length of frons, upper facets greatly enlarged, bright orange-yellow, contrasting with small black lower facets and narrow posterior margin; ocellar tubercle deeply sunken. Antennae more slender than in female. Palpi fusiform, tapering distally, light yellowish cream, with white hairs. In one specimen both wings have a rudimentary appendix on R₄.

Three specimens are placed as *Cydistomyia ?brevior* (Walker): 1 male, from Nourlangie Ck, NT, has palpi with mostly white and very few black hairs, the style is not dark and does not contrast with the basal plate, the abdominal colouration is darker, and the abdominal venter is more brown than yellowish or amber; 2 females from Rimbija Island of the Wessel Islands, NT, have more uniform grey-brown abdominal colouration, particularly on the venter, and lack the yellow-brown contrast seen in *C. brevior*. In one specimen both wings have a rudimentary appendix on vein R₄.

Remarks. Walker (1848) described *Tabanus marginatus* var. β based upon 2 specimens, “a” and “b”. Examination of these by Miss Ricardo (1915a) indicated that specimen “a” from New Holland was not var β .

Distribution. Coastal and inland NT from Bathurst Is. to W of Katherine. NT: Bathurst Is., Oct., G.F. Hill; Maningrida, light trap, Mar., J.L. and M. Gressitt; Five Mile Swamp, S of Maningrida, Mar., Gressitt; Gove, M.D. Murray; Berrimah, Jan., D. and A. Daniels; Mar., M.D. Murray; Holmes Jungle, Palm Ck, 15 km NE of Darwin, Mar., J.L. and M. Gressitt; Mudginbarry, Mar., Apr., attacking buffalo, A.L. Dyce; Beatrice Hill, to man, Jan., M.J. Muller; Jabiru, Jan., G. and A. Daniels; Koongarra, 15 km E of Mt Cahill, at light, Nov., Mar., at light, D.H. Colless; U.A.R.R.S. Adelaide R., Mar., A.L. Dyce; Kakadu Nat Pk, nr Jim Jim, Jan., D. Bickel; 20 km S of Adelaide R., Feb., R. Eastman; Brock's Ck, Jan., T. Campbell; Mt Burrell Feb., R. Eastman; Umbakumba, Groote Eylandt, Apr., R.R. Miller; 20 Mile Siding, Mar., G.F. Hill; 100 km W of Katherine, Jan., A. Zwick;

***Cydistomyia pseudobrevior* Mackerras & Spratt. sp. nov.**

(Fig. 50)

Type material. Holotype female, Qld, 5 km W by N of Rounded Hill, Oct. 1980, D.H. Colless (ANIC). Paratype females (5), same data as holotype; 1 female, 1 km N of Rounded Hill, Oct. 1980, D.H. Colless (ANIC).

Non-type material examined. QLD: 19♀ 3 km NE of Mt Webb, Oct., 1980, D.H. Colless (ANIC); 1♀ Isabella Falls, Battle Camp Road via Cooktown, Dec., D.K. Yeates (ANIC).

Diagnosis. A small narrow-bodied yellowish-brown species, with pale apical bands on abdominal tergites and faint median triangles on tergites 2–4, raised bell-shaped callus, pedicel without dorsal prolongation, entire forelegs dark brown, yellowish costal and subcostal cells of wing and with well-defined right angle on vein R₄ but without appendix. To be distinguished from *C. brevior* by absence of ocellar tubercle and no suggestion of ocellar spots, tapering extension of callus generally not reaching to middle of frons, bulging subcallus, absence of a dorsal prolongation on the pedicel and presence of median triangles in midline on abdominal tergites 2–4.

Female. Head. Eyes in life green, bare (few scattered hairs barely visible at 35X magnification). Frons relatively narrow, parallel, index 4.0–4.2, with pale creamy fawn tomentum and short dark brown hairs; vertex hollow, vertical triangle ill defined, greyish brown with short black hairs; ocellar tubercle not observed; callus brown, shiny, distinctly raised, slightly narrower than frons at base, bell-shaped, with tapering extension generally not reaching to middle of frons. Subcallus bulging, smooth, with cream tomentum, without hairs; parafacials and face with greyish white tomentum and fawn white hairs; beard white. Antennal scape cylindrical, distinctly longer than wide, light yellowish cream, with short black hairs; Pedicel about half as long as wide, without dorsal prolongation, colour and hairs as on scape; basal plate brownish orange, with small dorsal angle projecting as small knob, with few short black hairs at angle; style brown. Palpi moderately plump, pale cream, with short black hairs.

Thorax. Scutum and scutellum almost uniformly brown, paler anteriorly and laterally, with short black and creamy white hairs. Pleura pale grey, with white hairs.

Legs. Femora brown, whole of foreleg dark brown with dark brown hairs, mid and hind femora with creamy to whitish hairs; tibiae brown, with dark brown hairs mixed with yellowish cream ones on paler parts;

tarsi dark brown, with black hairs.

Wings. Pale greyish to almost clear, costal and subcostal cells yellowish; stigma yellowish brown; veins light yellowish brown, darker apically and distally; cell R_4 wide; vein R_4 angulate, without appendix.

Abdomen. First tergite yellowish fawn, tergites 2–4 light brown, remainder dark brown except 7th, with light yellowish fawn apical bands; hairs dark on darker parts, yellowish cream on paler areas and forming median triangles in mid line on tergites 2–4. Venter brownish grey, with pale apical bands on sternites; hairs predominantly yellowish cream.

Remarks. A single male specimen from Iron Range, north Qld, Aug., R. Jenkins, collected on its own may represent the male of this species. It is small, narrow-bodied and distinguished from male *C. brevior* by darker abdomen and pale apical bands only on tergites 2–4, although present on all sternites; second segment of palpi short; antennal basal plate small but robust; legs pale.

Distribution. Cooktown region N QLD.

Etymology. The specific epithet derives from the similarity of the species to *C. brevior* which occurs in the Northern Territory while *C. pseudobrevior* appears restricted to north Queensland.

Cydistomyia griseicolor (Ferguson & Hill)

(Fig. 51)

**Tabanus griseicolor* Ferguson & Hill, 1922: 262. Holotype female, from Hughenden, north Qld (ANIC).

Cydistomyia griseicolor; Mackerras, 1959: 169; Daniels, 1989: 287; Bickel & Elliot, 1998-2005: 3.

Other material examined. 9 ♀.

Diagnosis. A medium-sized, slim-bodied, almost concolorous greyish fawn *Cydistomyia* distinguished from all other species by its exceptionally wide frons, small irregularly quadrate mahogany brown callus and known only from north western Queensland. Length 10–11 mm.

Female. Head. Eyes (relaxed) brown, bare (few scattered short hairs barely visible at 35X magnification). Frons wide, distinctly divergent, index 2.0–2.4, with fawn tomentum, paler and more greyish along eye margins and at side of callus, with short dark brown hairs; vertex slightly hollow; vertical triangle indefinite but with relatively dense hairs; ocellar tubercle not developed, small irregular hollow spot in this position; callus small, mahogany brown, irregularly quadrate, with narrow inconstant extension not reaching to middle of frons (best marked in type). Subcallus flat, with fawn tomentum, without hairs; parafacials and face with greyish cream tomentum and short white hairs; beard white. Antennal scape and pedicel pale fawn-cream, with short black hairs and some white ones below; basal plate brown with orange tint, dorsal angle blunt but well defined; style dark brown. Palpi pale yellowish cream, with short white and scattered brown hairs.

Thorax. Ground colour of scutum grey, with narrow fawn dorsocentral vittae and lateral margins, appearance is of fawn scutum with three grey vittae, pattern not as conspicuous as in *trilinealis* but particularly distinct in anterior half, with erect black and appressed yellowish cream hairs; scutellum uniformly greyish, with dull creamy hairs. Pleura fawn-grey, with dull creamy hairs.

Legs. Fore and hind femora dark greyish brown, mid femora lighter brown, fore femora with light brown hairs, others with cream to creamy white hairs; tibiae light yellowish cream, with preponderantly pale hairs; tarsi more brown, darker apically, with dark brown hairs.

Wings. Lightly greyish, costal cell not darkened; stigma brown; veins light brown.

Abdomen. Almost uniformly greyish fawn, sometimes with yellowish tint in middle, with apices of tergites inconspicuously paler; hairs entirely yellowish cream, short and sparse giving abdomen smooth appearance. Venter similar, with patch of black hairs in middle of 7th sternite.

Distribution. Inland N QLD. **QLD:** Dugald R crossing, 75 km N of Cloncurry, Jan., M.S. & B.J. Moulds; Granada Stn, Cloncurry, Mar., G. van Tets; Julia Ck., Mar., Bell; Richmond, Dec., P.J. Skerman; Hughenden,

Mar., Brady; Watten, M. Taylor; Winton, Feb., M. Whitmore; Rodney Downs, SW of Aramac, Dec., G. Russell

***Cydistomyia* spp.**

Several specimens are suspected of representing new species. Further material is essential before formal designations and descriptions are made. However, localities and distinguishing features are set out below to encourage and assist others who may meet them in the field or in collections.

***Cydistomyia* sp. A**

Material examined. QLD: 1♀, 2 km SE Paluma, 914 m, rainforest, u.v. light, Jan., E. Britton, (ANIC).

A slender, 13 mm, brown species represented by a single female appears to be distinct, although close to *pseudoardens* and *fergusoni*. It is not named pending collection of further specimens, but may be distinguished from *C. pseudoardens* by the wider frons, wider more triangulate callus with extension barely reaching middle of frons, darker antennal style, pale apical bands on abdominal tergites overlaid with short white hairs but not expanded to form median white haired triangles, darker more uniformly chocolate brown venter with prominent pale apical bands on sternites and overlaid with sparse white hairs, paler less chocolate brown colouration of wing veins and stigma, uniformly brown costal cell, and darker greyish brown scutum with more clearly demarcated dorsocentral and lateral vittae. The species is distinguished from *C. fergusoni* by the narrower callus not extending full width of frons at base, absence of ocellar tubercle, presence of plump palps with dense black hairs, absence of median white-haired apical triangles on abdominal tergites, and costal cell of wing uniformly suffused with brown.

***Cydistomyia* sp. B**

Material examined. QLD: 1♀, Little Mulgrave R., Gordonvale, Nov., G.B. Fairchild (ANIC).

A small, greyish brown species represented by a single female appears to be distinct, although close to *C. musgravii* and collected with a series of good *C. rivularis*. Length 10.5 mm. Eyes in life yellowish green, without bands, bare. Frons narrow, index 4.5, parallel, with fawn tomentum; ocellar tubercle small, slightly raised, shiny, brown, with well-defined anterior ocellus. Callus small, dark brown, not bulging, tear-drop shaped, approximately one-half width of frons at base, with narrow delicate extension to mid frons. Subcallus smooth, with fawn tomentum. Antennal scape and pedicel fawn, with black hairs; flagellum orange-brown, basal plate narrow, with minute sub-basal dorsal projection. Palpi fawnish brown, with black hairs. Legs brown, with dark brown hairs, darkening on tarsi. Abdomen brown, with narrow greyish white apical bands on all tergites and greyish white median triangles on tergites 2–6. Abdominal venter grey, with narrow pale apical bands on sternites 2–6, 7th sternite dark brown. Wings faintly grey, costal cell not darkened, stigma brown, small, veins conspicuously dark brown, R₄ without appendix.

***Cydistomyia* sp. C**

Material examined. WA: 1♂, 4 km ESE of Millstream, Oct., 1970, Upton and Feehan (ANIC).

A male is near *C. brevior* (Walker) but is more uniformly brown with much paler abdominal markings;

legs brown with forelegs darker than others; eyes large, bare, upper facets enlarged, contrasting with smaller lower facets; ocellar tubercle deeply sunk; antennal basal plate with gently rounded dorsal angle; with dorsal anterior projection on pedicel; palps creamy with few short black hairs and numerous long white ones; vein R₄ less angulate, with no rudimentary appendix.

Cydistomyia sp. D

Material examined. WA: 1♂, Millstream-Chinchester Nat. Pk, 27-30 Apr. 2003, C. Lambkin & T. Weir (ANIC).

Similar to previous male but with more yellow-brown abdomen with grey-brown apical margins on tergites 1-6; upper eye facets much larger; scutum with three vague vittae.

Cydistomyia sp. E

Material examined. WA: 1♀, Weano Gorge, Karagini Nat. Pk., 20-25 Apr., 2003, C. Lambkin & T. Weir (ANIC).

A female near *C. brevior* (Walker) but with brown abdomen with greyish-brown apical bands on tergites 2-5; callus not full width of frons at base, rectangular oblong with fine narrow extension not reaching mid-frons; antennal basal plate larger than in previous two specimens, with gentle dorsal angle; anterior projection on pedicel; scutum with three vague vittae; legs uniformly pale brown, forelegs not appreciably darker than others; venter pale yellow-brown.

Cydistomyia sp. F

Material examined. NT: 1♂, 1♀ Tindal, NT, light trap, Dec., W.J.M. Vestjens (ANIC).

A male and female is also near *C. brevior* (Walker) but with greyish brown abdomen with pale apical bands; light fawn palpi, more stout; dark antennae, with numerous black hairs on scape and pedicel; robust dark or orange-brown basal plate, dark brown style; wider frons, callus not full width of frons at base and with extension not reaching middle of frons.

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Footnote 1 Page 10; Hairs cannot be seen at 15X magnification when surface of eye is illuminated obliquely or tangentially.

Footnote 2 Page 10: *Cydistomyia torresi* and *C. brevior*.

Index of specific names of Australian species of *Lissimas* and *Cydistomyia*

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